TOOL & DIE JOURNAL

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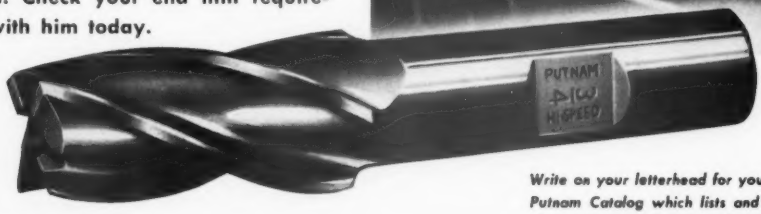
Your tool crib will always have dependable end mills on hand if you specify Putnam. Your Putnam Distributor can give immediate delivery from the largest regularly-stocked, catalog-priced end mill selection in the country . . . over 800 different end mills known for their maximum free cutting and longer lasting qualities. Check your end mill requirements with him today.



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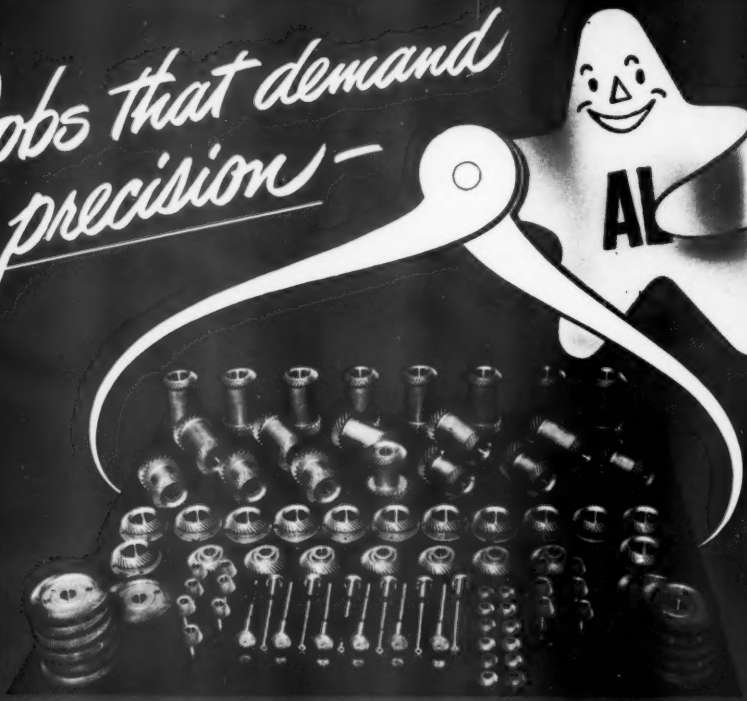

—they're the jobs for DEWARD Oil-Hardening Tool Steel

For Complete Data, write for the

DEWARD BLUE SHEET

Contains full information, certified as laboratory tested and proved, on the physical properties and characteristics of DEWARD Tool Steel, and best methods of handling and treatment. *Send for your copy.*

ADDRESS DEPT. TD-74

Wherever your specifications call for hardened machine parts in precision work, you'll gain greatest advantage by using DEWARD Oil-Hardening Tool Steel—famous for its freedom from distortion after heat treatment.

This quality caused the selection of DEWARD for the complete set of precision gears illustrated above, which must run absolutely true in operation. After grinding, the gears are heat treated at 1425-1500° F., oil-quenched and then drawn at 750° F., resulting in a hardness of 48-51 Rockwell C. With no distortion, the final regrind and lapping of the bolt before assembly becomes a simple, quick, low-cost operation.

For any jobs of this general nature, let us show you how DEWARD can save you time and money in production, give you a better finished job—*or both!* Our Mill Service Staff is at your command, without obligation.

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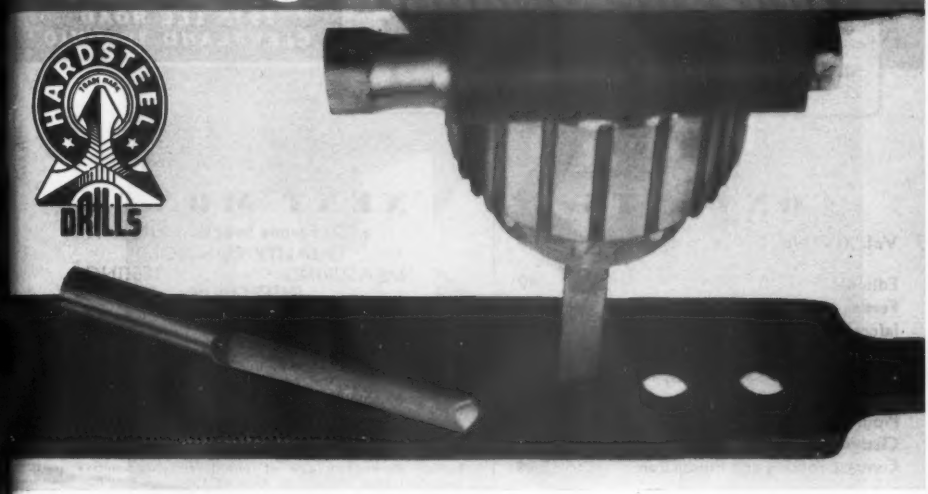
TOOL STEEL DIVISION: DUNKIRK, N. Y.

Fine Tool Steels Since 1854

AL

Drill Hardened Steels *without Annealing* with "HARDSTEEL"



Don't let anyone tell you that hardened steels must be annealed before drilling, countersinking, counterboring or reaming.

With "HARDSTEEL" drills you can produce accurate, smooth holes in steels hardened by any process—oil-hardened, water hardened, cyanided, nitrided, and they work equally well on work-hardening steels and high carbon-high chrome steels of any degree of hardness.

"HARDSTEEL" drills used with standard drill presses cut costs in production shops because parts drilled after hardening always match at assembly. In service shops they save time and material and permit engineering changes calling for additional drilling to be made after parts are full hardened.

Write for a copy of the "HARDSTEEL" Operators Manual showing how "HARDSTEEL" drills are now functioning in thousands of plants in parts recovery operations.

You Harden It—We'll Drill It—with "HARDSTEEL"

"HARDSTEEL" Tool bits make faster, deeper cuts on steels and non-ferrous alloys.

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DRILLS • TOOL BITS • SPECIALS

TOOL & DIE JOURNAL

TOOLING AND PRODUCTION

1975 LEE ROAD
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Tool & Die Journal is published monthly for plant operating and purchasing executives and department heads in 48 types of end product and contract manufacturing companies, and is directed to them individually. Rate of subscription to others, including Schools, Libraries and Individuals, $4.00 per year. Single copies fifty cents.

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NEXT MONTH

a TDJ Feature Issue devoted to

QUALITY CONTROL
MEASURING TESTING
INSPECTION

•

"Streamlined Quality Control". The job of selling quality control to the man at the bench and machine has been accomplished with outstanding success by Jack & Heintz Precision Industries, Inc. This article describes the shortcuts effected whereby the "decisions rendered" by comparators, plug gages, dial indicators and other measuring tools give a picture of both product quality and machine condition.

•

"Gage Control". The gages that are used to insure quality control must in turn be subject to quality control. This feature shows how one of our largest automotive parts manufacturers, Thompson Aircraft Products Co., has set up its gage control and master standards departments.

•

"Accuracy in Angular Measurement". A know-how story on obtaining the highest precision in machine settings and inspection of angles in producing lamination die segments.

•

"Optics In Metalworking". A TDJ feature article on the applications of optics to the metalworking industries' gaging, measuring and inspection problems. The practical use of light waves for comparative measurements; measuring microscopes, optical flats and profile projectors will be presented in terms of their work-a-day, shop applications.

•

"Practicing What We Preach". One of the leading exponents of quality control is the Federal Products Corp. C. W. Kennedy tells how Federal has applied statistical quality control to manufacturing operations which are of a job shop nature rather than mass production.

•

New Products
Production Machines, Tools and Accessories. Toolroom Equipment. Measuring Tools and Gages.

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Catalogs, Pamphlets, Data.

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Acts as a lubricant, retards corrosion, prevents rusting. H.K Dowel Pins, made from H.K Special Analysis Alloy Steel, are hardened, carburized, double precision ground. Every dowel pin 100% individually inspected. Available from Stock.
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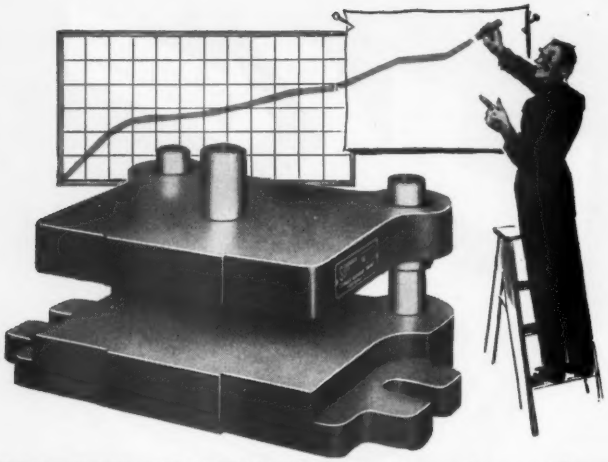

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- **Operate presses faster and longer** — "Standard" Indium Bronze guide pin bushings assure long life at high operating speeds. .
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YOU GET ALL THESE ADVANTAGES IN

NICHOLSON ROTARIES
HAND CUT AND MACHINE GROUND

STYLES A wide range of shapes and sizes from which to choose. Name almost any rough or delicate finishing operation and Nicholson will come up with a Rotary File or Bur that will save both time and money.

CUTS Available in either Hand Cut (for use on tough, dense materials) or Ground-from-Solid (for non-ferrous metals). Expert hand-cutters form the teeth of Nicholson Rotary Files; precision machines grind the flutes of Nicholson Burs.

STEEL Nicholson regular Rotary Files and Burs are made from a special grade of high-speed steel, expertly hardened and carefully shaped.

SHANKS Standard shanks are ¼" in diameter. Nicholson also has a complete line of Rotary Files and Burs with ⅛" shanks. These "little fellows" are ideal for relatively delicate power filing.

CODE SYMBOLS The Nicholson system of identification makes for easy ordering. The first symbol identifies the style or shape of the head; second, the diameter of the head; third, the length of the head; and fourth, the coarseness of the cut.

TRADE-MARK The famous Nicholson trade-mark is your assurance of quality—of rotaries carefully shaped, centered, cut or ground and hardened. Available through your industrial distributor.

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NICHOLSON ROTARY FILES NICHOLSON U.S.A.
HAND CUT AND MACHINE GROUND • HIGH SPEED STEEL AND CARBIDE

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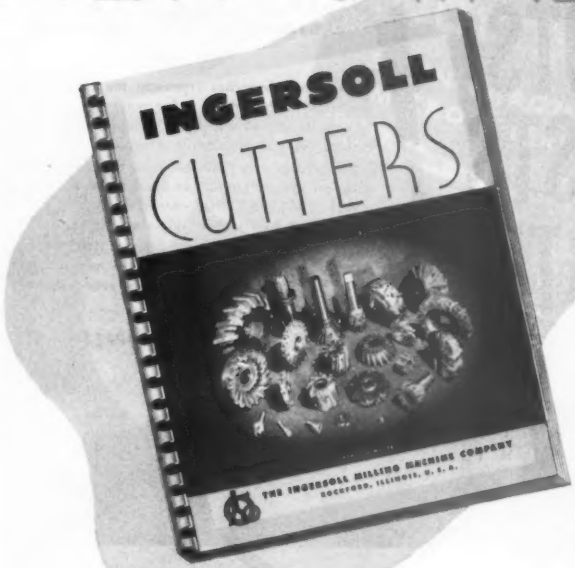
NEW CATALOG



Complete information on all types of Ingersoll Inserted Blade Milling and Boring Tools . . . illustrations, detail drawings, specification tables, grinding charts, how to order and other useful data.

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BROACHING CUTS COSTS FASTER!

PIONEERS OF H.S.S. BROACHING

COLONIAL

BROACH CO. DETROIT 13

BEST BY TEST

Colonial broaches represent the fastest, surest, precision method there is for removing metal. May be used equally effectively for all kinds of internal or external shapes, regular or irregular.

Wherever they CAN be used, they are bound to give you greater output per machine hour—and that means REAL SAVINGS—savings that pay for the tooling cost in a surprisingly short time.

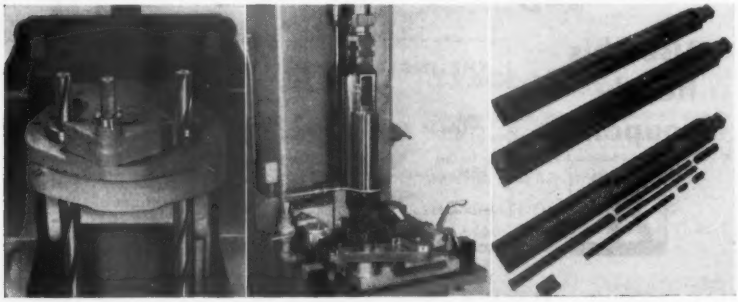
There's a Colonial field representative near you. Ask us to have him figure where and how much *you* can save; how much you can boost your output per machine hour.

-----STEEL----------BRONZE----------COPPER----

Internal Gears & Splines
in one pass of a broach

Telephone Relay Parts
360 precision parts per hour

Electrical Breaker Arms
900/hour by surface broaching



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Now *all* Starrett Micrometers—including the popular Thimble Friction type and the popular priced Black Frame type—will have the new, non-reflecting Satin Chrome Finish. No more squinting, no shifting to better light . . . the markings stand out sharp, clear and easy to read under any illumination. And eye-soothing Satin Chrome Finish is highly resistant to stains and corrosion.

Now, more than ever, be sure you specify STARRETT Micrometers.

Buy Through Your Distributor

PLUS THESE BIG FEATURES
AT NO EXTRA COST

- Hi-Micro (mirror-like) finish on faces of anvils and spindles to insure more accurate measurement.
- Threads hardened, stabilized and ground from the solid.
- Quick Reading Figures with every graduation on the thimble numbered for positive identification.
- Decimal Equivalents of 8ths, 16ths, 32nds and 64ths conveniently marked on the frame.
- Simple Adjustment for wear.

STARRETT

MECHANICS' HAND MEASURING TOOLS AND PRECISION INSTRUMENTS · DIAL INDICATORS · STEEL TAPES · HACKSAWS AND BAND SAWS · PRECISION GROUND FLAT STOCK
Buy Through Your Distributor

THE L. S. STARRETT CO. · *World's Greatest Toolmakers* · **ATHOL, MASSACHUSETTS, U. S. A.**

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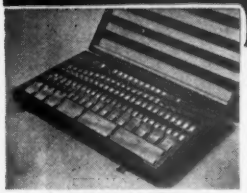
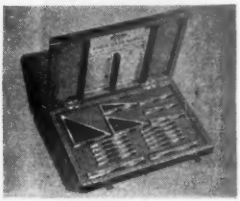
here are two booklets that can help you

AVOID PRODUCTION DELAYS



84B Accuracy: .000008"
84 block set $250.00



Angle Gage Blocks increase speed and precision of angle inspection.

Delays due to changes in design and procedure can raise havoc with production schedules particularly if special gages are necessary before work can proceed.

Delivery of plug, ring, angle gages, indexing plates and dividing heads can be days away, yet a simple precaution can avoid this holdup.

Webber Angle Gage Blocks and Fixtures and Heavy Duty Blocks and Fixtures provide the answer. They fill so many purposes in this direction that production is rarely held up for lack of precise dimensional controls.

Some of the more important applications are detailed in the booklets shown above; other applications suggest themselves after quick inspection.

Send for these booklets and learn how dimensional short cuts can easily clip days off your delivery schedule.

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12903 Triskett Rd., Cleveland 11, Ohio

These are the direct factory representatives who can tell you about the advances in precision measurement that Webber has made possible.

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Exclusive Canadian Distributor
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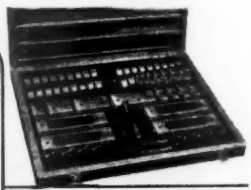
Carbiax Wear Gages add the wearing qualities of carbide to any standard steel gage block set.
2 sizes, $21.50 and $27.53.

Webber

MICRO-ACCURATE GAGE BLOCKS and FIXTURES



Transferring the extreme precision of gage blocks to the work without time taking precautions is one of the outstanding advantages of Webber Heavy Duty Gage Blocks and Fixtures.

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TIMKEN GRAPHITIC STEELS HAVE EXCELLENT STABILITY

ONE OF FIVE BIG REASONS WHY TIMKEN GRAPHITIC TOOL STEELS MAKE BETTER TOOLS, DIES AND GAGES

ONE of the tough problems in making accurate gages is to get good stability of structure in the gage material. Timken graphitic tool steels answer that problem.

After expansion or contraction caused by temperature changes in working conditions, gages made of Timken graphitic tool steels return to their original dimensions with a minimum of error.

This error in the graphitic steel gages used in the manufacture of Timken roller bearings is maintained at millionths of an inch!

The presence of free graphite and diamond-hard carbides in the structure of Timken graphitic tool steels also gives them better machinability and greater resistance to wear. In addition, they respond uniformly to heat treatment. And they have less tendency to scuff and score.

Timken graphitic tool steels are made in five analyses, each with special advantages for particular applications. They are Graph-Mo, Graph-Tung, Graph-Al, Graph-Sil, and Graph-M.N.S.

If you would like to learn more about Timken graphitic tool steels, write for a free copy of our 48-page, illustrated booklet, "Timken Graphitic Tool Steels". The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH

Specialists in alloy steel—including hot rolled and cold finished alloy steel bars—a complete range of stainless, graphitic and standard tool analyses—and alloy and stainless seamless steel tubing.

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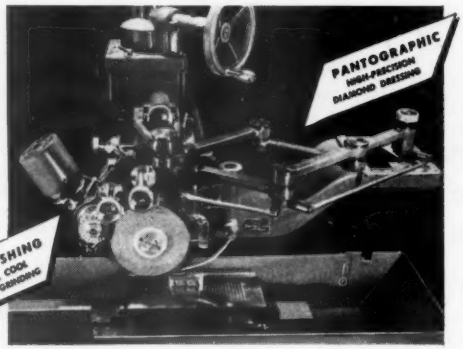
Now you can combine roll-crushing and diamond dressing in a single wheel dresser to speed form grinding

Before the development of the Moore Panto-Crush Wheel Dresser, diamond dressing and crush-forming of surface grinder wheels called for the use of separate devices. These required considerable set-up and operating skill, particularly where odd contours other than true radii and straight surfaces are involved.

Now with the Moore, permanently mounted on the wheel spindle of a surface grinder, both crush-forming and diamond-dressing are accomplished in a single mechanism.



Here's how this 2-in-1 machine does it:

1. Combines Pantograph, working directly from template, and *Roll-Crushing* in one device, accurately related to spindle.

2. Switches from one method to the other without disturbing workpiece setting or location of either trueing device.

3. No setting up of complex attachments each time wheel is dressed... no raising of wheel spindle from work to dress, yet wheel spindle may be raised or lowered without losing relation of wheel form to dressing device... crusher method saves diamond costs.

4. Assures highest roll-crushing accuracy and economy. Crusher roll is *ground* and *used* on same spindle, without disturbing position... no expensive machine required to grind crusher roll... no worry about hardening distortion, because roll is ground *in place* from the solid directly from template.

5. Takes Skill out of job, yet adds advantage of crush dressing for heavy cuts without heating work, and ultra-precision diamond dressing.

6. Device need not be removed to use machine as conventional surface grinder.

Both MACHINE DESIGN and MACHINERY magazines devoted considerable editorial space to technical discussions of the value of this ingenious new mechanism. We'll be glad to send you reprints and a descriptive catalogue on Panto-Crush.

MOORE SPECIAL TOOL CO., Inc.
726 UNION AVENUE, BRIDGEPORT 7, CONN.

HAVE YOU BOUGHT YOUR COPY OF "PRECISION HOLE LOCATION"?

Over 5,000 copies of this valuable book on toolmaking practices have been sold to date. Available at special price of $3 in U. S. A.; $3.50 outside U. S. A. 448 pages, over 400 illustrations. 184 pages of Woodworth Coordinate Location Tables from 3 to 100 holes. Send check or money order to Moore Special Tool Co., Inc., Bridgeport 7, Conn.

Add a MOORE to YOUR TOOLROOM

JIG BORERS · JIG GRINDERS · PANTO-CRUSH WHEEL DRESSERS
DIE FLIPPERS · COMPLETE LINE OF HOLE LOCATION ACCESSORIES

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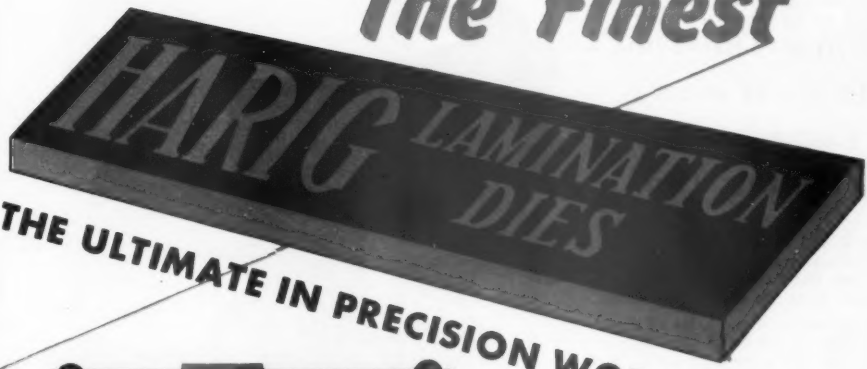
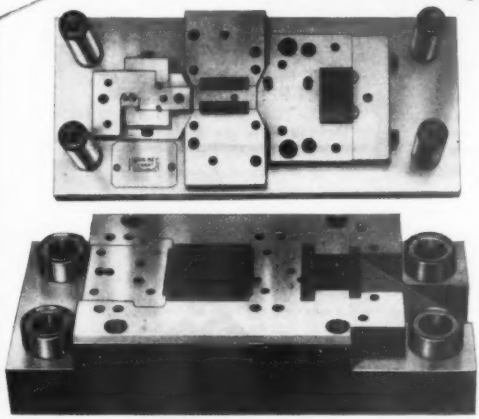
YOUR PRODUCT DESERVES

The Finest



THE ULTIMATE IN PRECISION WORKMANSHIP



CARBIDE

NOW PRACTICAL FOR LAMINATION DIES.

Illustration Shows Typical HARIG Carbide Die.

Section of Our 17,000 Sq. Ft. of Die Making Space. Illustration Shows a Portion of Surface Grinding Dept.

Also STAMPING DIES OF ALL TYPES
JIGS, FIXTURES, GAUGES, SPECIAL MACHINE WORK

Your Inquiries Invited

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MANUFACTURING CORPORATION

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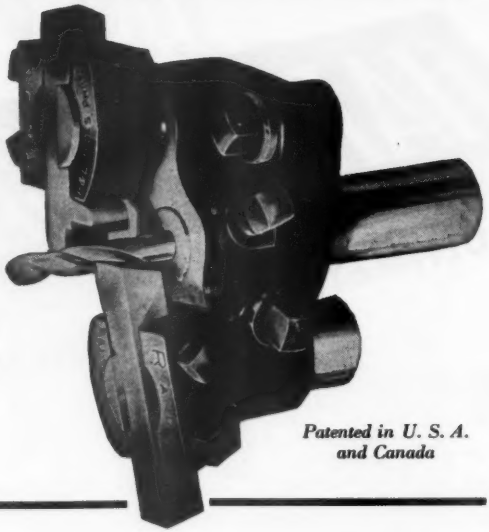
1=14 @ 1/4 The Cost

When The Tool Is an R and L Combination Turning Tool



One R and L Combination Turning Tool, the only combination right hand and left hand tool on the market, actually does the work of 14 tools.

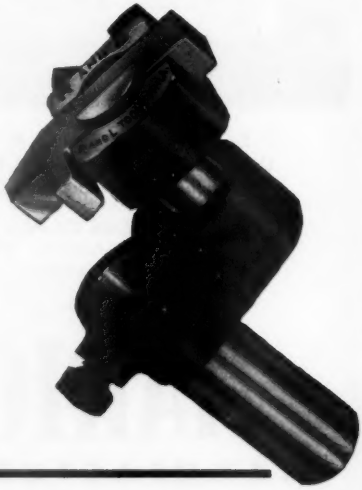
You can use an R and L for all these right hand or left hand applications: Roller Box Tool • Centering and Facing Tool • Knee Tool • Pointing Tool • Back Rest • Floating Drill Holder • Balanced Turning Tool.

The change from right to left or vice versa takes only ten seconds.

Patented in U. S. A. and Canada

NEW R and L
TURRET BACKREST HOLDERS

Simple design allows for convenient interchanging of R and L carbide surfaced backrest. Built in three sizes, ⅝", ¾" and 1" diameter shank.



WRITE FOR LATEST COMPLETE BOOKLET OF ALL R and L TOOLS

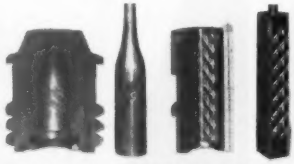
R and L TOOLS *1825 Bristol St., Philadelphia 40, Pa.*

WITH SPRINGFIELD HYDRAULIC REPRODUCER

Now you can secure **accurate** three dimensional contour reproductions with the completely hydraulic, super-sensitive Springfield Reproducer on Springfield Geared Head Lathes. Reproduces internal, external, and face contours using a master, a template or the piece itself. Holds reproduction to extreme limits of accuracy.

Its usefulness and versatility are remarkable—it will trace a compound curve, follow the flats of a square milk bottle, profile and write simultaneously, bring out every detail of the most intricate design, turn a straight, smooth taper on a bar, cut a perfect spiral or a large cam and perform many similar money-saving, time-saving jobs that come up constantly.

Write today for catalog and complete information. We will gladly demonstrate on your work to show what the Springfield Reproducer will do



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Indispensable in the Tool Room and Machine Shop . . . Adaptable for General Engraving, Brass Routing, Die and Mold Duplicating

This new 0-16A *Gorton Super-Speed mill incorporates all of the features necessary in an "all purpose" machine. It will do a better job for you on any work within the limits of its size.

The Gorton 0-16A is *rugged*. It is designed for operator convenience and features extremely sensitive table and saddle controls. Spindle speeds from 300 to 10,000 R.P.M. available. ½ H.P. motor.

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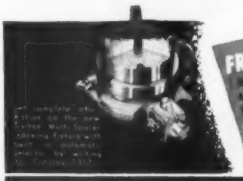
DESIGNED FOR VERSATILE DUTY—Check These Features

Heavy column, adjustable ram, super-speed spindle permanently lubricated, swivel or universal head, positive spindle brake, spindle lock, quill lock, depth stop graduated in thousandths, micrometer and lever feed on spindle.

Adaptable for . . .

. . . General engraving and brass routing by using special extension spindle and foot treadle attachments . . . Die and mold duplicating by adding tracer head and duplicator table.



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Tracer Controlled Milling
1209 RACINE STREET • RACINE, WISCONSIN, U. S. A.

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● Punches made from highest quality water-hardened tool steel. Retainers are suitable for "Standardized" Punches or your own special punches. Write today for illustrated catalog.

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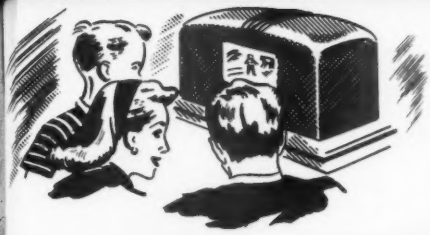
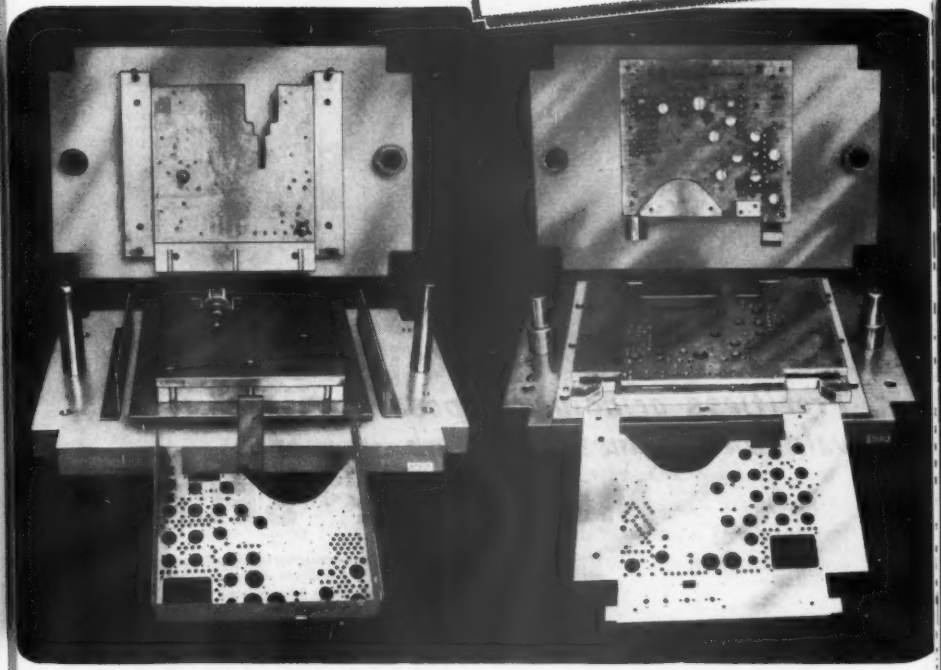


TELEVISION CHASSIS formed and pierced with BARTH DIES



ONE OF THE MOST COMPLICATED CHASSIS may well be the General Electric Television base frame illustrated above, which is pierced and formed with the two Barth Dies shown.

Two other dies not shown, were required to produce the blank and pierced openings to provide die walls of sufficient thickness to maintain uninterrupted production schedules. The forming operation was also utilized to subdivide the piercing still further.

If you have a die, tooling or special machinery job . . . no matter how intricate or hair-splitting the requirements . . . Barth has the know-how, the craftsmen and the equipment to do your job. The scope of Barth's organization and facilities is exemplified in their latest catalog of which a copy will be sent you upon request.

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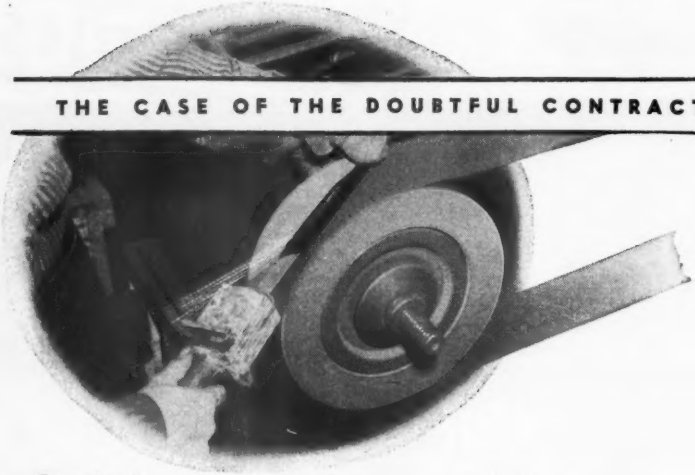
DESIGNERS AND BUILDERS OF DIES, TOOLS AND SPECIAL MACHINERY

THE CASE OF THE DOUBTFUL CONTRACT



Profitless grinding proposal becomes valuable business through use of

METALITE* BELTS

Even with his sharpest pencil this cutlery manufacturer could not figure any profit to him, using set-up wheels, in a proposed contract including rough and finish grinding sheath knives. Then he considered the belt backstand method — and the proposition immediately became good business.

Using a Hammond Model 3 backstand with Behr-Manning hard-density contact wheels, 12" x 4" x 1¼", and Durabonded Metalite Cloth Belts, grit #60-X and #100-X, he realized the following production performance: First, production volume 60% above "profit-level" estimate; second, production costs 45% below "profit-level" estimate.

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Our booklet "Production Talks — Backstands" gives you a whole series of similar case histories with convincing facts and figures. Write for your copy today.

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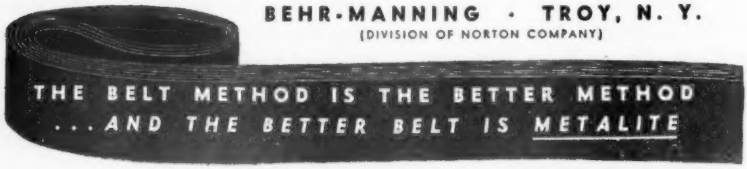

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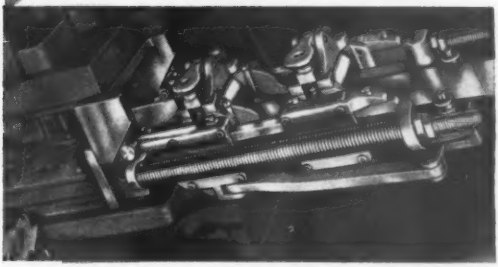

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The AUTOMATIC FEED FOR *any* PRESS

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SERIES 1700—Two models: with chamber sizes 8½" W, 7½" H, 13½" D or 8½" W, 7½" H, 18" D. Both for 230-volt operation. Prices—$250.00 to $385.00 complete with controls.

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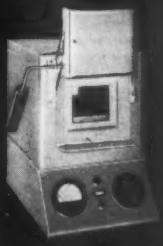

SERIES 1500—Two models: with chamber sizes 4" W, 3½" H, 4½" D and 4" W, 3½" H, 9" D. 115 or 230-volt operation. Prices—$87.50 to $107.50 complete with stepless control.

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Do your own heat treating... right in your own plant or shop... save time and costs, eliminate sending work "outside". Investigate this rugged *entirely new* TEMCO line today... welded steel construction, heavy dual insulation! Fast-heating and can be operated continously up to 1750° F., intermittently to 2000° F. Use for hardening and tempering of tools, dies, parts and small unit production. Ideal, too, for lab testing and process control. Write today for data and your nearest dealer's name.

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IN GROUND THREAD Socket Set Screws

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Free from hardening distortion, mirror smooth, they have none of the nicks, burrs and other imperfections common to cut threads.

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Available for Prompt Delivery

PARKER-KALON COLD-FORGED **SOCKET SCREWS**

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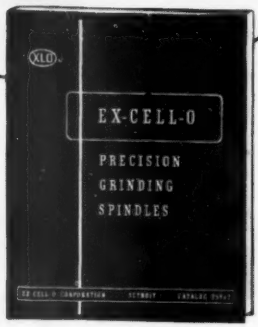
Precision

GRINDING SPINDLES



The materials used in Ex-Cell-O Precision Grinding Spindles and Ex-Cell-O High Speed Precision Ball Bearings are the finest; the manufacturing, heat treating and inspection methods are the most modern; the workmanship is skilled and exacting.

You can apply Ex-Cell-O Precision Grinding Spindles to your machines with the definite assurance that you are using the best!

A new illustrated 80-page, easy-to-use catalog lists Ex-Cell-O Precision Grinding Spindles, spindle brackets and quills, and gives information on their application to grinders, new and old. Included are spindles for internal grinders, universal grinders, surface grinders, tool and cutter grinders, and special applications. For your free copy, write today for Bulletin 25962.

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DANLY *Precision* DIE SET

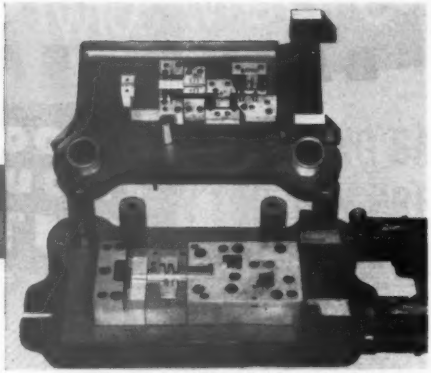

Photo courtesy of Federal Tool Corporation, Chicago

Tolerance of .001" held on 10-station progressive die

Here's another example of how Danly Precision Die Sets maintain close tolerance punch and die relationship on high production work.

The part illustrated, a nut chopper cutter, is produced on a 10-station progressive die at a rate of 7,200 pieces per hour. An average of 100,000 pieces are obtained between grinds. Tolerance of .001" between stations is maintained.

save time USE DANLY NATION-WIDE DIE SET ASSEMBLY SERVICE

Assembly plants (marked with stars) stock interchangeable parts for quick assembly and delivery of any standard die set to your specifications.

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To date the same original Danly Die Set has held the tolerance required for a total of 1,500,000 pieces, and under normal operating conditions, will continue to give many more hours of profitable service.

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HELPFUL ENGINEERING SERVICE — For helpful engineering service on Die Sets of any size, standard or special, for any type of press operation, consult Danly without obligation.

write for this *free* bulletin

Illustrates how you may use Danly's special machining and welding service to save additional time and money.

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Let Barnes band saw blades . . . noted for their smoother, easier cutting and trouble-free, economical performance . . . prove their qualities on your band saw operations. Check your needs with your Barnes Distributor who carries a complete line for every metal cutting requirement.

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- **HARD EDGE FLEXIBLE BACK**
  . . . for general all-purpose cutting
- **ARC-LINE**
  . . . for all contour, die-cutting and similar applications
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  . . . for high-speed sawing of soft non-ferrous alloys, plastic, fibre, etc.
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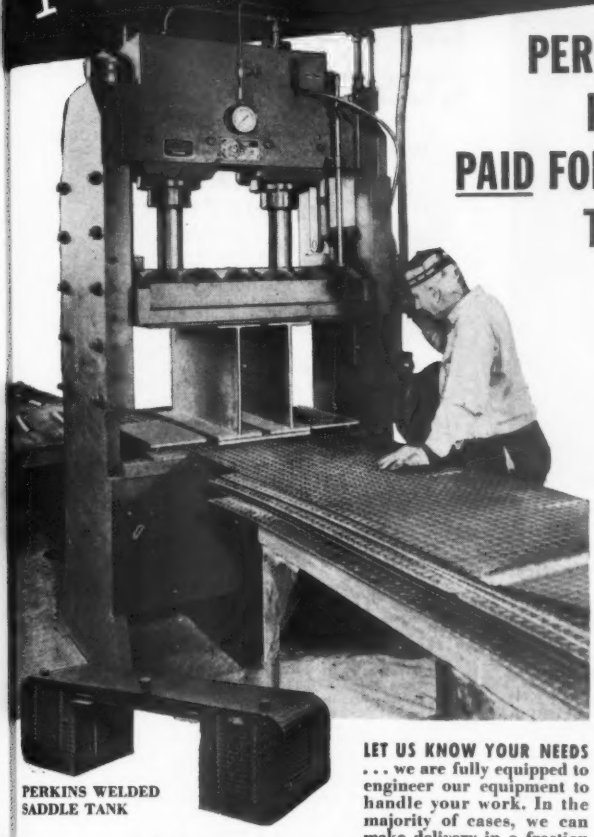

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BIG TRAILER TRUCKS eat up a lot of gas on an average run. For that reason most are equipped with big "saddle tanks" which hold 125 gallons or more... thus obviating frequent stops to fuel up. Perkins Welding makes these super tanks out of 1/8 inch steel. Until recently, they welded angle stiffeners onto the tanks for extra strength. A KRW Engineer showed them how they could save considerably by forming stiffening ribs on a KRW 100-Ton Press. The result... savings so great that "it paid for itself in 60 days."

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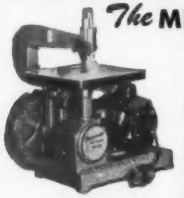
...with these 2 MACHINES

The **MILWAUKEE DIE FILER**



Model FS with new All-Purpose, Deep-Throated Overarm performs all tool and die-making operations efficiently, at low cost.

Files, saws and lapping sticks chucked at upper end. Spring tension adjusted in overarm chuck. Chucking close-to-work assures rigidity of saws and files. Table tilts 15° in four ways. Lower chuck has ball-jointed jaw for true alignment of files with crooked shanks.

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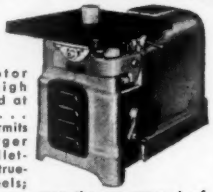
Built for Precision Grinding

Available in *two models* — STANDARD and HIGH SPEED . . . for mounted stone wheels and diamond or carbide wheels respectively. ½ H.P. Ball Bearing Motor maintains high spindle speed at Full Capacity . . . no stalling. Permits use of larger wheels. Collet-Chuck assures true-running wheels; permits fast, easy mounting or removal of wheels. Built-in Diamond Wheel Dresser always ready — no loose parts to assemble.



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DIE FILERS • PROFILE GRINDERS

Every STAMPING PLANT needs . . . .

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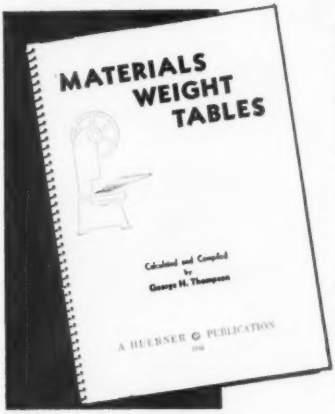

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"Easy to use" — only one computation instead of the four usually necessary with a slide rule.

The book includes 32 pages of tables for sheet stock, 4 pages for bar stock, 3 pages for drill rod and conversion factors for 20 different metals, thus making the tables apply to almost any stock you might be working.

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to Work!

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DREMEL'S Improved MOTO-TOOL . . . the little electric grinder that does big jobs . . . can save you hours, by speeding up work now being done by hand. Invaluable for sharpening taps, drills, gauges, chisels, tools and cutters (without tearing down "set-ups"). Dremel Moto-Tool is a "war veteran" . . . used by all branches of the Armed Forces in far-flung repair bases . . . helped to set production records at General Electric, Westinghouse, Remington Arms, Ford, Nash-Kelvinator, Northrup, Douglas and other plants.

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● Housing has "pencil-type" finger grip ● Instant-action, wrenchless chuck ● Oil-less, sealed, trouble-proof bearings ● Patented automatic chuck lock pin ● Oversize armature shaft, hardened, ground and polished ● 110 volt, universal type (AC-DC) motor ● Easily replaced commutator brushes ● About 27,000 R.P.M.; cuts cleaner . . . saves cutters ● Sliding snap-type switch ● Handy hanger hook ● Cord protector ● Sturdy, shock-proof bakelite housing ● Dust-filtered air-cooling system ● Weighs only 13 oz. . . . shaped to fit the hand ● Dynamically balanced for vibrationless operation.

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WITH 23 ACCESSORIES
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Moto-Tool No. 2, with one emery point $16.50

See your mill supply dealer. If he does not handle Moto-Tool, write the factory.

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MULTIPRESS* prove its advantages on *your* specific job!

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Although Denison files are packed with case histories proving the ability of MULTIPRESS to increase production, reduce scrap loss and improve quality —you still must know exactly how MULTIPRESS can do these same things *on your specific job.* That's where the Denison Application Test Laboratory comes in!

In the Denison testing laboratory you'll find whole batteries of MULTIPRESSES of all types and models, with a complete range of accessories and attachments for many applications. Our engineers will recommend the model best suited to produce your particular application—and then actually set up and process your parts or material on that machine so that you can see the MULTIPRESS proving its advantages *on your work.*

There's no obligation when you accept our invitation to use this Denison service. Just send your material and the necessary dies, along with an engineer or someone familiar with the technical requirements of your project—and expect to be pleasantly surprised! All laboratory work of this nature is, of course, strictly confidential. To arrange a MULTIPRESS laboratory testing schedule for your product, write or call The Denison Engineering Company.

THE **DENISON** ENGINEERING CO.
1197 DUBLIN ROAD, COLUMBUS 16, OHIO

DENISON EQUIPMENT—APPLIED HydrOILics

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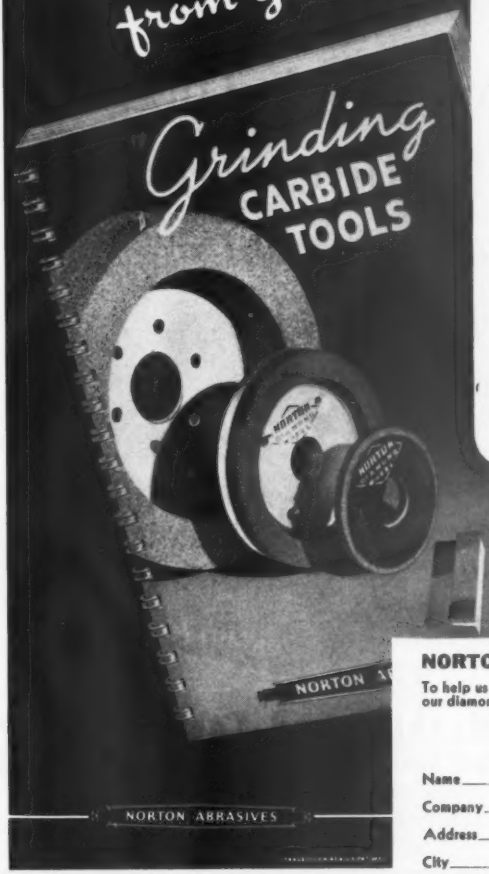
Here's How Norton Can Help You to Get

GREATEST EFFICIENCY from Your Diamond Wheels



1.

WITH this new handbook — over 130 pages of practical information — it tells you how to select the most suitable type of diamond wheels for each carbide tool grinding job and how to get maximum life from each diamond wheel. Also covers the use of Crystolon (silicon carbide) wheels.

2.

WITH two new motion picture films, "Grinding Carbide Tools" and "The Diamond Wheel — Its Care and Use" — running about 20 minutes each, these sound and color films are a "must" for every shop using carbide tools — ideal for foremen groups, shop training classes, technical societies, vocational schools.

NORTON COMPANY . Worcester 6, Mass.

To help us get more service from our diamond wheels please send:

☐ Your handbook "Grinding Carbide Tools"

☐ Booking information on your two new films.

Name_____ Title_____

Company_____

Address_____

City_____ Zone_____ State_____

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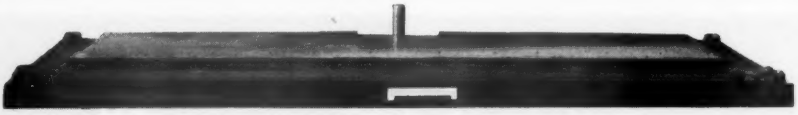

This 12-Foot Die was designed and built by BUNELL

when you need Dies, Jigs and Fixtures *larger than the average tool and die shop can handle . . .*

Check with Bunell

We are also equipped to do the small fussy work and the average size as well as the larger jobs shown above.

THE BUNELL Machine and Tool Company
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Contouring IRREGULAR Shapes

1. by AUTOMATIC DUPLICATION

2. by MANUAL CONTROL

Cincinnati Shapers contour irregular shapes —economically—whether in the tool room or in the manufacturing plant.

(1) Where production is desired, costs are reduced by accurate automatic duplication.

(2) A unit or small lot is economically produced by manual control.

Accurate, sensitive, vertical and front controlled cross feeds and the overall accuracy of a Cincinnati Shaper enable the operator to work to very close limits.

Write for information on contouring irregular shapes on a Cincinnati Shaper, the handy man of tool rooms and shops.

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SHAPERS · SHEARS · BRAKES

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RACINE *Hydraulics*

HELP PRODUCE A CRANKSHAFT A MINUTE

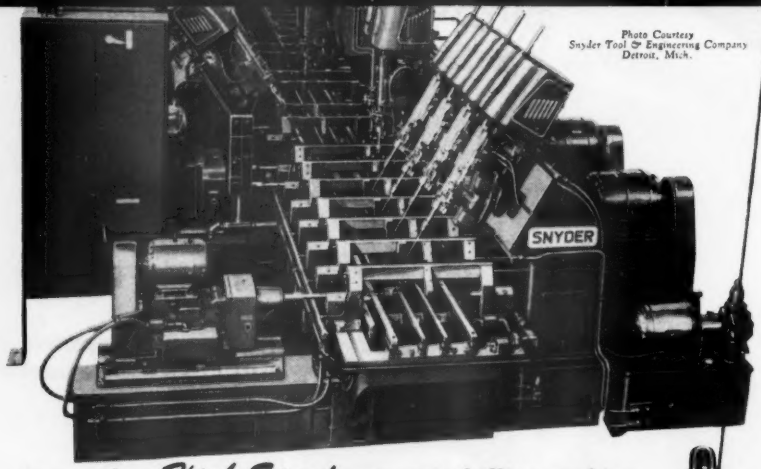
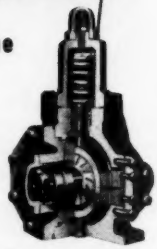


Photo Courtesy
Snyder Tool & Engineering Company
Detroit, Mich.

. . in a modern *High Speed* automatic drilling machine



Four RACINE Variable Volume Pumps, each impelling six drilling units, supply the hydraulic power for drilling and reaming sixty crankshafts an hour on this Snyder "IN-LINE" special automatic machine.

Mounted on a single base and controlled at a central push button station, the machine shuttles each crank through twenty-eight stations. The complete work cycle of positioning, clamping, drilling and reaming is accomplished through hydraulically actuated vises and spindles in a smooth, rapid sequence.

Here, hydraulic automatic operation is protective as well as productive. When drills are overloaded because of excessive chip accumulation or variations in metal hardness, the spindles retract automatically, thus reducing drill breakage.

With RACINE constant pressure variable volume pumps, no accumulators, unloading valves or pressure reducing valves are needed to level out pressure fluctuations. Adjustments are thereby reduced from eight to one. There is less initial cost, lower operating expense and less possibility of breakdown.

This is but one example of the efficiency of RACINE hydraulics. It will pay you to investigate its possibilities for your work movement and handling problems. Let our hydraulic engineers work with you . . . no obligation. Address Racine Tool & Machine Company, 1778 State Street, Racine, Wis. Ask for Catalog P-10-C.

RACINE *Oil Hydraulic* VARIABLE VOLUME PUMPS and *Hydraulic* VALVES

Pumps in capacities to 30 g.p.m. up to 3000 p.s.i. Four-way hydraulic valves, balanced piston-sleeve type, available in a wide range of styles and portings in 3/8" to 1 1/2" i.p.s.

RACINE STANDARD FOR QUALITY AND PRECISION

1775 State Street, Racine, Wis. Ask for Catalog P-10-C.

SEND FOR THIS Hammond CARBIDE TOOL GRINDER CATALOG

THIS 8½" x 11" CATALOG contains "Helpful Suggestions" on the handling and grinding of Carbide Tools and shows our complete line of Chip Breaker and Carbide Tool Grinders. Mail coupon today. Catalog No. 220 will be sent promptly.

HAMMOND MACHINERY BUILDERS, Inc.
631 DOUGLAS AVENUE, KALAMAZOO, MICHIGAN

YES we are interested. Please send us a free copy of Carbide Tool Grinder Catalog No. 220.

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With Two DI-ACRO BENDERS

A difficult production problem of forming two bends in a long length of tubing was solved by "teaming up" two DI-ACRO Benders as illustrated. This dual-forming arrangement saved installation of special machinery. Two accurately formed bends are obtained in one operation—without distortion of the tube and at a cost competitive to power operated equipment. More than 300 pieces are completed per hour—600 individual bends.

"DIE-LESS DUPLICATING" Often Does it Quicker WITHOUT DIES

This is but one example of how DI-ACRO precision machines —Benders, Brakes and Shears—can accurately and economically duplicate a great variety of parts, pieces and shapes, without die expense. Write for catalog—"DIE-LESS DUPLICATING".

◀DI-ACRO is pronounced "DIE-ACK-RO".

DI-ACRO PRECISION MACHINES DIE-LESS DUPLICATING

O'NEIL-IRWIN MFG. CO.

315 EIGHTH AVENUE • LAKE CITY, MINNESOTA

PLEASE USE INFORM-A-GRAM FOR PRODUCT INFORMATION

Only a few minutes' *Set-Up Time*

and you're ready to make a

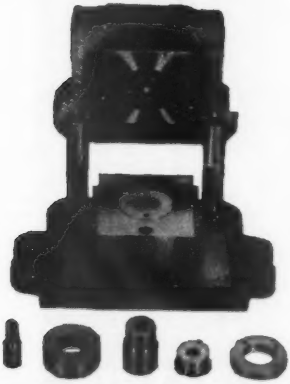
NEW SIZE WASHER

when you use...

HOVIS

UNIVERSAL MASTER

WASHER DIES



Once having made a nominal investment in Hovis Master Washer Dies to fit your requirements, all you need is to change five small easily removable parts to make a new size washer. This takes only a few minutes. Think of what this means in the saving of time, materials, process engineering, tool designing and tool tryout! And you can make washers on short notice as you need them, avoiding large inventories. The Master Dies themselves do not become obsolete.

Write for illustrated folder.

← Made in 5 sizes:

$\frac{3}{4}$"—1$\frac{1}{2}$"—2$\frac{1}{2}$"—4"—6".

HOVIS SCREWLOCK COMPANY

8100 E. NINE MILE ROAD
Phone: Centerline 1575

VAN DYKE, MICHIGAN
Suburb of Detroit

Protect This VITAL PART of Your Machines!

NUT of alloy steel, heat treated with Class 3 fit thread, and washer face commercially square with threads.
WASHER heat treated steel, chamfered edges. Ground to uniform thickness and hardened.
THREADS Class 3 fit.
SHANK ground for accuracy.
HEAD Machined square with shank. Square, flat surface of head fits machined surface of T-slot.

It is cheaper to use precision made bolts than to repair expensive machines. Poorly made bolts of soft steels can quickly ruin the accuracy of a machine.

Boyar-Schultz S. M. B. Bolts are made to protect the T-Slot. They are precision made from upset alloy steel forgings and threaded for a Class 3 fit. Use S. M. B. Nuts and Washers with S. M. B. Bolts for firm, delicate adjustments. They hold work in exact position for heaviest machine cuts.

BOYAR-SCHULTZ
Copper Head Laps

Economy and accuracy are the outstanding features of Copper Head Laps. They work rapidly. Only the replaceable copper sleeves wear out. Sleeve adjustment permits maintaining correct lapping size till worn out when it is replaced with a new one. Save costly tool room time. Available from stock in standard sizes, 1/8" to 2 1/2" Diameters.

BOYAR-SCHULTZ CORPORATION

2112 WALNUT STREET **CHICAGO 12, ILLINOIS**

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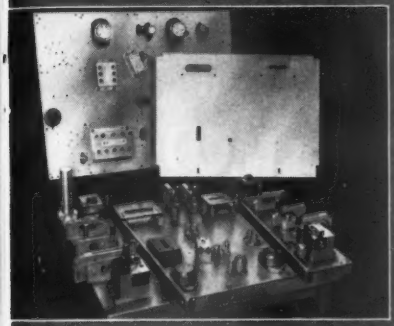
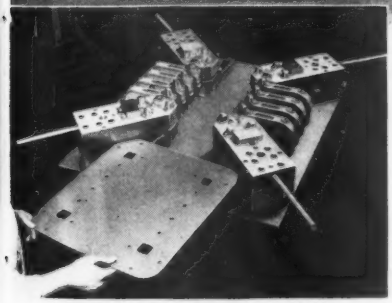
A WORD ABOUT WALES

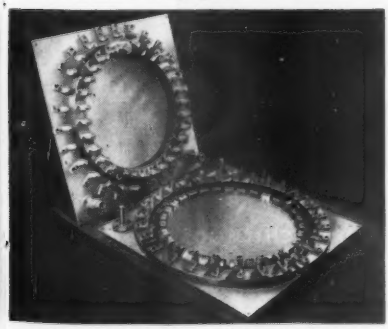
SERVICE ENGINEERS WHO CALL ON YOU



Setup of Wales Equipment, made for a large stove manufacturer.



Wales Equipment set up for an air conditioning cabinet manufacturer. Note holes and rounded corners in the work in foreground.



A setup of Wales Type "CD" Hole Punching Units for a jet engine manufacturer.

● Wales-Strippit Service Engineers are specialists in hole punching and notching,—selling no other line of equipment. Many of these Service Engineers have had several years' experience in the Engineering and Production Departments at the Wales-Strippit plant. They know from experience what Wales Equipment will do for you. These Service Engineers are as valuable to you as the Wales Equipment. Illustrations of Setups at left are typical suggestions made by Wales Service Engineers. Call them in for suggestions.

AS A FURTHER SUGGESTION

Before deciding on the hole punching and notching portion of your tooling program, check with Wales-Strippit engineers who may solve your particular hole punching problems by using STANDARD adaptations of STANDARD Wales Equipment. Join the large group of leading manufacturers who have made it a rule to call on Wales-Strippit before putting holes in angles, channels, extrusions and sheets by *any* method.

WALES-STRIPPIT CORPORATION

GEORGE F. WALES, *President*

355 PAYNE AVENUE, NORTH TONAWANDA, N. Y.

(Between Buffalo and Niagara Falls)

WALES-STRIPPIT OF CANADA, LTD., HAMILTON, ONTARIO

Specialists in Punching and Notching Equipment

WHY USE AN ELEPHANT TO PULL A MILK WAGON

. . . . and

WHY BUY A BIG COSTLY SHAPER WHEN THE

AMMCO

WILL GIVE YOU TOP PERFORMANCE* UP TO 7"?

★ NO BIG SHAPER CAN BEAT THE AMMCO FOR ★ ACCURACY ★ VERSATILITY ★ SPEED ★ ECONOMY

You will save time, labor and electricity—and get finest precision work—every day you use this AMMCO 7" Shaper. It will do a wide variety of work—in fact, it has been called "the precision machine with a thousand uses." It is compact and saves floor space, tough enough for the heaviest production schedule, perfect for tool and die making and ideal for home work shops. Order the bench or portable cabinet models. Write for complete data and low prices and a copy of catalog TD648.

You can do it Better and Faster with AMMCO *Skill is Built into Every Ammco Product*

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"DETROIT" standard die sets are Micro-metric jig-bored and machined to exceptionally close limits of parallelism, flatness and squareness with the guide-pin axis. This precision reduces strain warping, and results in longer die life and long, uninterrupted production runs. Order from your "DETROIT" representative.

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MINNEAPOLIS	AT 5264
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PITTSBURGH	GR 1362
PORTLAND, ORE.	AT 3697
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TOLEDO	GA 5706

DETROIT DIE SET CORPORATION

2895 W. GRAND BLVD. • DETROIT 2, MICHIGAN

DETROIT DIE SETS ★

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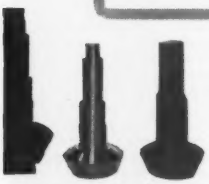
AIR-GAGE TRACING TEN SURFACES...

MONA-MATIC MACHINING TIME... *72 seconds per piece*



Template (at left) controls the Air-Gage Tracer mechanism to make a continuous single-point cut on the rough forging (at right) producing a finished bevel gear blank (center) in two operations. Tolerance: .005".

The unbeatable combination that makes this production possible is the Monarch Mona-Matic, equipped with rear tool slide and the Monarch Air-Gage Tracer.

The machining cycle is fully automatic. One operator can service a battery of two Mona-Matics, *easily*, thereby doubling his output per machine. While the single-point Air-Gage Tracer-controlled tool on the front slide makes a continuous cut to finish the principal diameters, the rear slide traverses in to perform the necking, grooving and forming cuts. That way no time is lost in needless second operations—and there are a minimum of cutting tools to synchronize or resharpen.

The end result is more production—and finer finishes—at less cost. In other words, to use Monarch's oft-quoted maxim, "*Peak Production at a Profit*". May we show you how the Monarch Mona-Matic with Air-Gage Tracer can make that statement more than just a slogan—in your shop?

THE MONARCH MACHINE TOOL CO., Sidney, Ohio

Monarch TURNING MACHINES

FOR A GOOD TURN *FASTER* – TURN TO MONARCH

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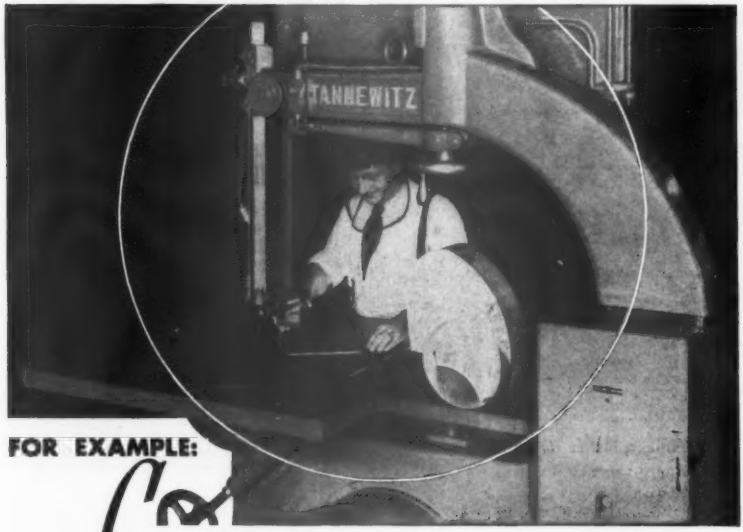
FRICTION SAWING

solves thousands of Problems!



FOR EXAMPLE:

CUTTING side panels of a barometric damper as shown above. Cost of dies required for seven sizes would have approximated $12,000 — a prohibitive sum for volume required on these sizes. Friction-sawn on a TANNEWITZ High Speed Band Saw in multiples of two in 1.2 minutes each — a very moderate cost which makes feasible the complete line required. Cost of machine was only a small fraction of cost of dies contemplated and it is also available for many other uses.

For trimming castings, formed parts, cutting metal as hard as a file and dozens of other operations, too, friction sawing with TANNEWITZ High Speed Band Saws offers tremendous advantage. Write for free booklet, "FRICTION SAWING."

THE TANNEWITZ WORKS GRAND RAPIDS 4, MICHIGAN

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Eliminate STICKY FIXTURES

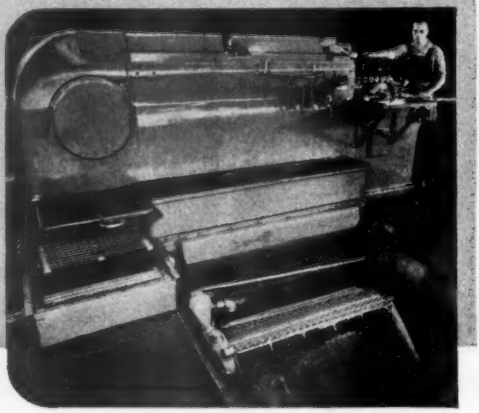
WITH

BARNESDRIL

Automatic

COOLANT SEPARATOR

Example:
Foote-Burt Broaching Machine



★ Timken Roller Bearing Company surface broach Rock Bits for the mining and contracting industries at their Colorado Springs plant. Fine sludge and chips accumulating from this operation foul the coolant and collect in the fixtures, causing them to stick and jam. These fixtures are precision-designed with gears, sleeves, and other intricate parts, and the problem of periodic maintenance, along with shutting down the machine has been a serious cost problem.

BARNESDRIL engineers working closely with plant production officials, installed a No. 10 BARNESDRIL Coolant Separator on this job which automatically removed all particles from the coolant. As a result, this difficult fixture problem and a disagreeable job of cleaning sludge and sediment from the reservoir have been eliminated. Direct savings in cost have paid for the separator several times.

Why not check the application of BARNESDRIL Separators on your grinding, honing, shaving, shaping and broaching operations for similar savings and efficiency.

Send for Bulletin B151F

BARNES DRILL CO.

842 CHESTNUT STREET ROCKFORD, ILLINOIS U.S.A.

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Raise the Feed!

CUT COSTS WITH T-J CUTTERS

Do your cutting in tough die steels *faster* . . . with less breakage . . . and *more work between grinds!* Use T-J Die Sinking Milling Cutters! They're designed for accuracy and sturdiness . . . made from a standard, extremely high grade steel . . . properly machined . . . scientifically heat-treated and accurately ground. Many styles and sizes . . . proved on countless tough jobs! Send for new catalog. The Tomkins-Johnson Co., Jackson, Mich.

A T-J Cutter at work on a drop hammer die block for steering knuckles. The material is molybdenum die steel of C45-C50 Rockwell.

FOR TOUGH JOBS SPECIFY T-J

TOMKINS-JOHNSON

DIE SINKING MILLING CUTTERS

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NEW BENCHMASTER

DEEP THROAT 4 TON punch press

● Here's the press you need for punching large sheet steel and other stock in a jiffy. Its deep throat gives extra capacity—now enables punching to the center of a 17½" circle! Extra sturdy frame is heavily reinforced at all stress points. Press weighs 340 lbs.!

The new Benchmaster retains all the quality, engineering advantages and proven performance features of the standard model—yet gives you CAPACITY seldom encountered in larger presses! Available as a bench model or with legs as a standard extra. *Write for bulletin giving complete details.*

benchmaster MANUFACTURING COMPANY
2952 WEST PICO BOULEVARD
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WORLD'S LARGEST PRODUCER OF SMALL PUNCH PRESSES

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measuring, testing and inspecting

The October 1948 TOOL & DIE JOURNAL will constitute another "first"—the first issue of a metalworking publication to feature the tools and techniques of quality control.

In addition to the principles and practices of measuring, testing and inspecting, successful quality control depends upon the highest attainment in precision production.

The newest and finest in machines and tools are essential for repetitive production to the close tolerances demanded by full interchangeability in manufacture.

Successful quality control is predicated upon reducing all manufacturing variables to the irreducible minimum. This involves rigid adherence to materials specifications; machine and tool design and construction that insure constancy of performance; and workpiece design and dimensioning that are based on a true understanding of, and respect for, the problems and practicalities of repetitive, interchangeable manufacture.

The physical aspects of quality control have been with us since the days of the early Yankee toolmakers, i.e., measuring tools and gages on the one hand, and production machines and tools on the other. Over the years, these have all been subject to constant improvement and refinement so that as industry has demanded parts manufactured to closer and closer limits, we have had not only the precision machines and tools capable of producing consistently to such tolerances, but, as well, the precision measuring tools and gages capable of identifying and measuring the consequently smaller and smaller variables in the production processes.

There can be no control unless we can measure, because unless we can measure we cannot know in what direction and degree to exercise control.

During and since the war, industry has made increasing use of another phase of quality control, i.e., *statistical* quality control. Statistical quality control in itself is not a means of precision production; precision production quality is strictly dependent upon precision machines and tools. Nor is statistical quality control a means of measuring; precision measuring can only be accomplished with precision measuring tools and gages. Statistical quality control is simply a mathematical means of predicting or anticipating the occurrence and/or extent of measurable variations in repetitive operations.

In addition to the major editorial coverage of the October TOOL & DIE JOURNAL Quality Control Feature Issue, our departmental pages, detailing new products and new literature, will be equally representative of the precision measuring instruments, tools and gages, and the precision machines and tools essential to the control of production quality. Further, there will be a comprehensively indexed and cross-indexed directory of the tools, gages, machines and instruments of quality control.

Your October TOOL & DIE JOURNAL will be of long-life, reference value.

E. Willard Pennington

editor

An Important Announcement From The FORD MOTOR COMPANY

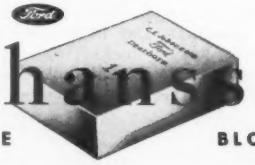
Since 1923, we have manufactured and distributed the world-famous Johansson Blocks.

We now have completed negotiations for the sale of the Johansson Gage Division of the Ford Motor Company to Brown & Sharpe Manufacturing Company of Providence, R. I. Before this transaction was completed, we gave very careful consideration to the problem of finding a company with the skill and experience that would assure continued production of Johansson Blocks to the Johansson standards of quality.

The Brown & Sharpe Manufacturing Company has 115 years of experience in the making of precision tools, and after careful study, we decided that this experience, coupled with their standing in American industry, made them the sound choice to take over the manufacture of these precision gages.

All patents, methods and machines required for making Johansson Blocks become the property of Brown & Sharpe. Machinery and special steel stocks are being moved to Providence.

Meantime we will continue to provide Johansson Blocks from available finished stock here at Ford until Brown & Sharpe are in operation and ready to supply them.



FORD MOTOR COMPANY

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by Hans Effgen
Mechanical Engineer
Globe Tool & Gage Works
Boston, Massachusetts

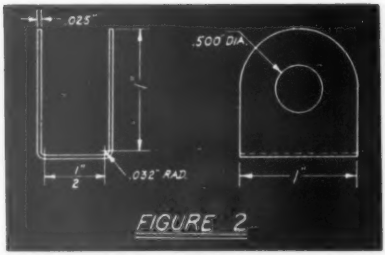


FIGURE 2

Die Design for Symmetrical Brackets — *Part I*

Brackets which are essentially symmetrical in shape, such as those illustrated in Figure 1, are produced by two station progressive dies having the same basic design features. There are definite items to be taken into consideration when approaching the design of this type die, and a few of the more important are given below. It is to be noted that most of these items are applicable to dies of all types. They are as follows:

1. Dimensions and tolerances of the part to be made.
2. Developed length of the part.
3. Design of die sections and punches:
   a. Height of die and punches.
   b. Type of cutting edge.
   c. Blending out radius on parting cut.
   d. Supporting "heel" on punch.
   e. Clearance between punch and die.
4. Size and type of stripper.
5. Thickness of punch plate and flange.
6. Tonnage required to produce part.

The small bracket shown in Figure 2 is produced from cold rolled steel strip .025" thick and 1" wide. The die from which this bracket was produced is illustrated in Figure 3. The bracket is parted to its developed length, that is, the length of the flat blank before it is bent up to the required dimensions, and then bent up against a spring pad.

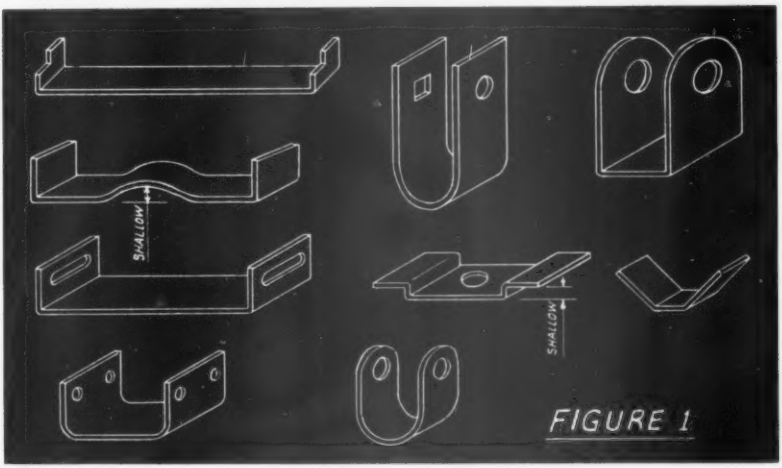
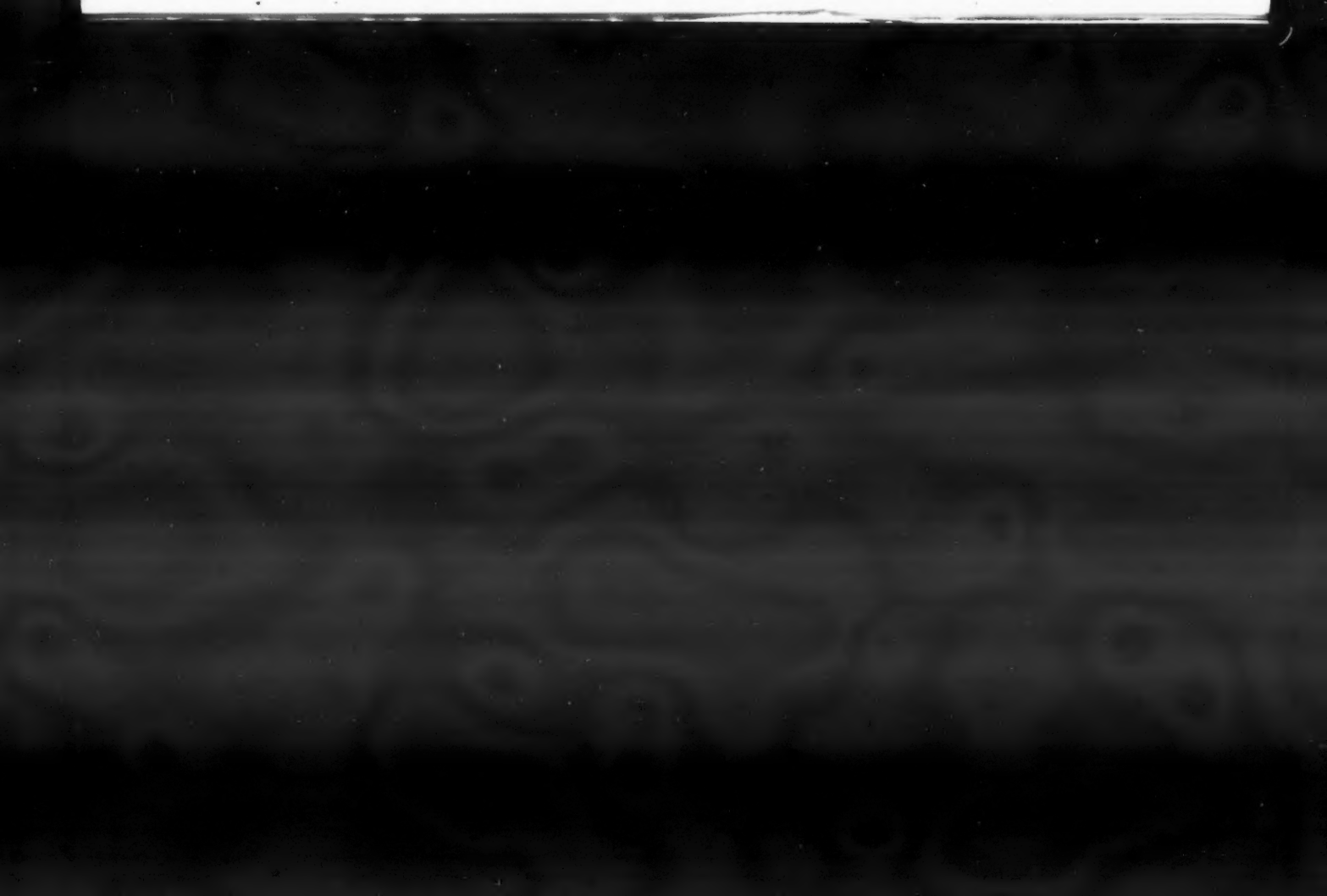


FIGURE 1



by Hans Effgen
Mechanical Engineer
Globe Tool & Gage Works
Boston, Massachusetts

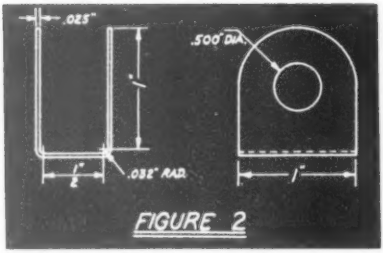


FIGURE 2

Die Design for Symmetrical Brackets — *Part I*

Brackets which are essentially symmetrical in shape, such as those illustrated in Figure 1, are produced by two station progressive dies having the same basic design features. There are definite items to be taken into consideration when approaching the design of this type die, and a few of the more important are given below. It is to be noted that most of these items are applicable to dies of all types. They are as follows:

1. Dimensions and tolerances of the part to be made.
2. Developed length of the part.
3. Design of die sections and punches:
   a. Height of die and punches.
   b. Type of cutting edge.
   c. Blending out radius on parting cut.
   d. Supporting "heel" on punch.
   e. Clearance between punch and die.
4. Size and type of stripper.
5. Thickness of punch plate and flange.
6. Tonnage required to produce part.

The small bracket shown in Figure 2 is produced from cold rolled steel strip .025" thick and 1" wide. The die from which this bracket was produced is illustrated in Figure 3. The bracket is parted to its developed length, that is, the length of the flat blank before it is bent up to the required dimensions, and then bent up against a spring pad.

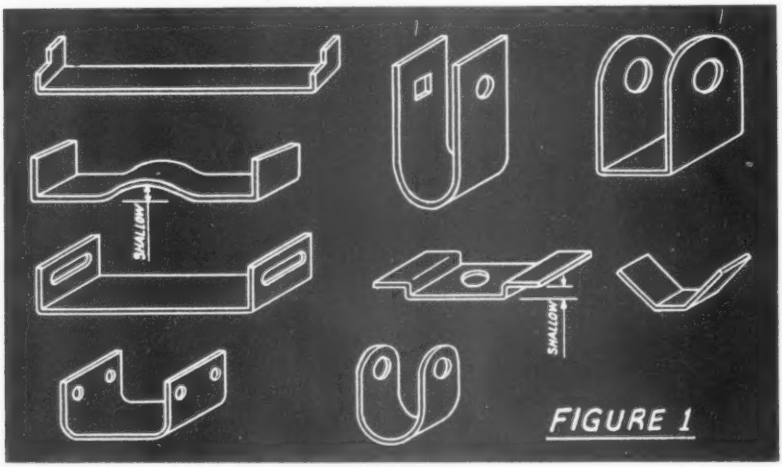


FIGURE 1

The general dimensions of the part must, of necessity, determine whether or not a die such as that of Figure 3 can be used to fabricate the part. If the piece were of such proportion as in Figure 4, it is quite probable that a design of this nature could not be used. A limiting factor would be the unavailability of a punch press of sufficient size, consequently requiring the use of a simple pierce and parting die, with a second-operation "V" bending die. However, should the part be of such size as that in Figure 2, then use of the indicated design is prompted. Final determination is, of course, made with knowledge of the equipment at disposal.

Let us assume that it is desired to tool up for the bracket which has been illustrated in Figure 2, using the design features depicted in Figure 3. The first step would be to determine the developed length of the part. Determination of the developed length is first made by ascertaining the length of the straight portions as indicated by "X", "Y", and "Z", Figure 5. Allowance for the bend is made on the assumption that the neutral bending point, for spring pad dies, is one-fifth the material thickness from the inside bend. The metal thickness at the bend point of a sharp corner or small radius is approximately 10 percent less after bending. This is caused by the material moving more easily in tension than it does in compression, and there-

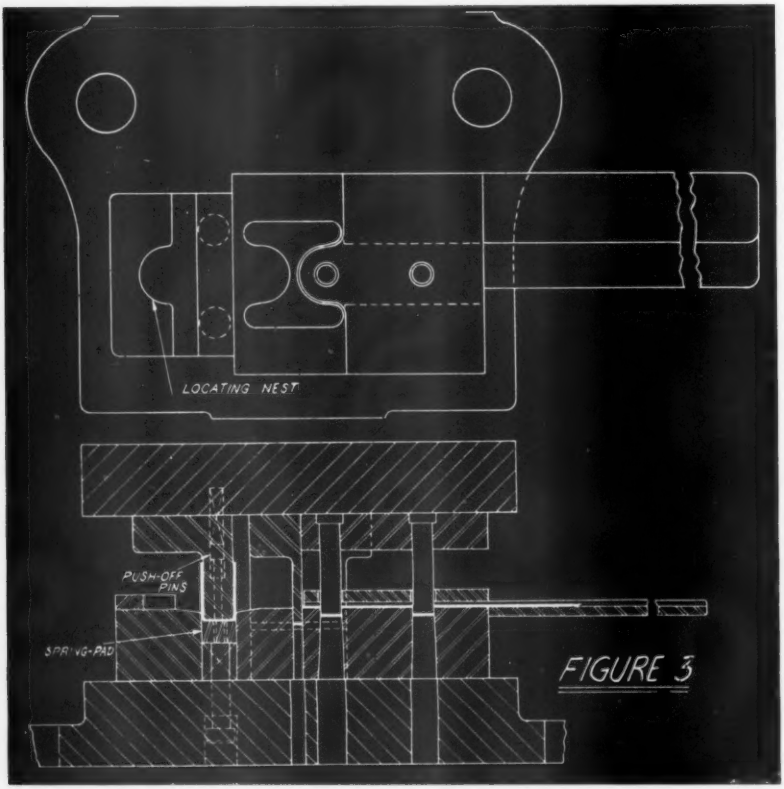


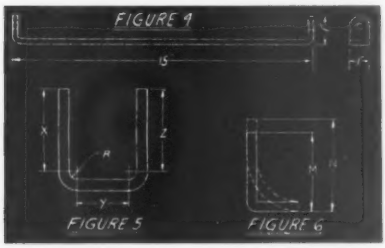
FIGURE 3

fore acts to move the neutral bending point away from the thickness centerline toward the inside bend point.

Thus the formula for finding the allowance for one 90° bend reduces to $(t/5 + R) \times 1.5708$. Substituting the values given in Figure 2 we have: $(.025''/5 + .032'') \times 1.5708$, and we have one 90° bend allowance of .0581″. The developed length is then given by the addition of the following values: X+Y+Z+twice the bend allowance, or: 1.000″+ .500″ + 1.000″ + .1162″, which equals 2.6162″. For work of more than usual accuracy, narrow test bending blocks are made to check this development, and in some cases to modify it slightly. The development thus derived and the sizes determined for the test bending blocks are duplicated when the actual die is built.

When testing, care should be taken to see that the grain of the material runs in the same direction as it will when the die is in operation. Often the bending station is built into the die first, and the development determined from it before the piercing and parting station is incorporated. For most cases, however, use of the developed length can be directly resorted to.

Close tolerance of the radius on the forming punch must be maintained because every additional increase or decrease in the radius will make the corresponding leg .0016″ longer or shorter respectively. This can readily be seen by reference to the formula for bend allowance, and by noting that for a given length of line, as is shown in Figure 6, solid line "M" is shorter than dotted line "N". Knowledge of this fact can be put to use should the two holes in the part come slightly out of line. If the radius of the bend does not require accuracy, as in most cases it does not, increasing or decreasing this radius can be utilized to compensate the error, thus bringing the two into line.



The height of die sections and punches is made on the basis of two determining factors: "life" of the die, and the height of the bracket after bending. The bending punch must be high enough to allow the legs of the bracket to be bent up without distortion. The length of the piercing and parting punches are necessarily determined by the length of the forming punch, but should have enough extra length to allow for resharpening without having to redress the forming punch.

The die section height is usually determined by the particular type of bend which is desired, and, as in the case of the punches, should be high enough to allow for the necessary resharpenings. Where it is possible the forming sections should be separated from the cutting sections, to enable sharpening of the cutting sections without having to grind the top of the bending blocks.

The piercing and parting holes in the die blocks are tapered throughout their entire length as in "I", Figure 7. A cutting edge with a straight land such as is shown at "III" is much more prone to become dull and, further, requires more stock removal to present a keen cutting edge than the cutting edge of "I" for a given amount of blank burr and quantity of pieces run off. The taper of the cutting edge is approximately 0.5°.

To prevent a sharp corner in the part as is shown in the left of Figure 8, the radius of the parting cut is blended out, as is shown in the right of this sketch, with the cutting line on a 5° to 10° taper, tangent to the parting radius. The type of parting cut shown in the left of Figure 8 is quite common where the parting cut is not blended out.

Clearance between the side gages is necessary if the strip is to be fed easily. This clearance is somewhat of an evil since it allows the operator to swivel the strip after it has been located in the end stop, causing the offset cut which has been described. This fault can be somewhat remedied by incorporating springs which act to push the strip against either the front or rear side

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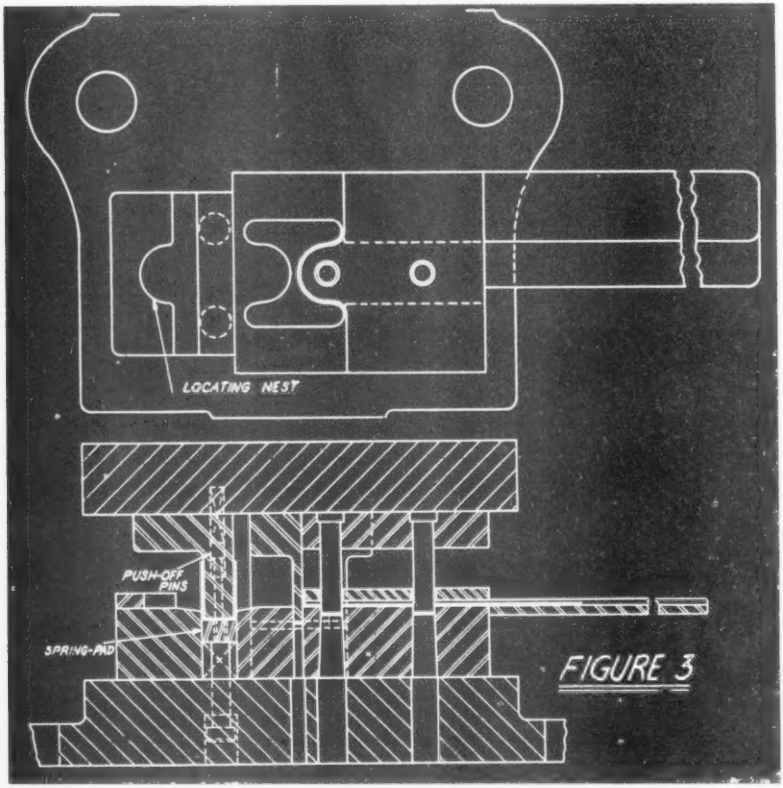

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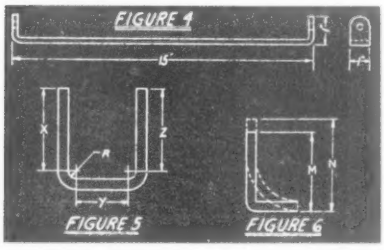

FIGURE 5 FIGURE 6

The height of die sections and punches is made on the basis of two determining factors: "life" of the die, and the height of the bracket after bending. The bending punch must be high enough to allow the legs of the bracket to be bent up without distortion. The length of the piercing and parting punches are necessarily determined by the length of the forming punch, but should have enough extra length to allow for resharpening without having to redress the forming punch.

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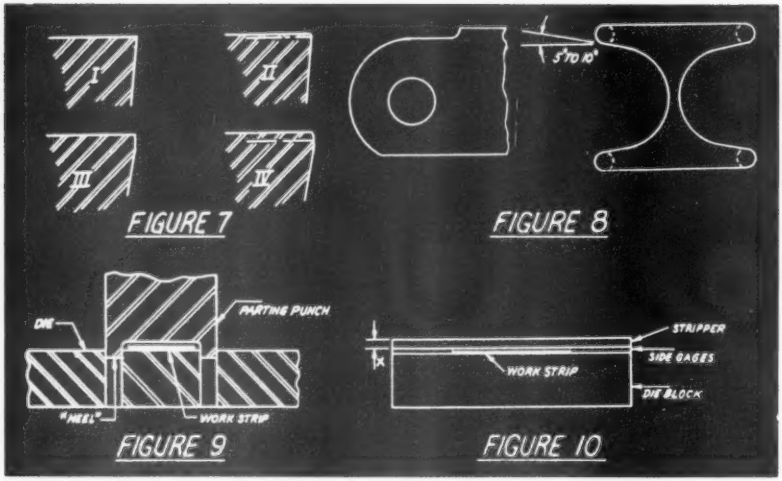

gage, and by blending out the parting radius.

Sometimes the parting punch is provided with a "heel" which enters the die well ahead of the actual cutting edge of the punch. Figure 9 illustrates this action. This heel is added in order to prevent the parting punch from "whipping" when the work strip is started and the punch is cutting on only one side. A heel of this type is usually found on dies mounted on die sets without guide posts and serves to take the place of these posts.

Required clearance between punch and die is most often designated as a percentage of the thickness of the material to be cut; this percentage varying with the type of material being cut. When cutting thin rubber sheeting, no clearance is allowed, the punch actually rubbing past the cutting edge of the die. When cutting spring steels, as much as 14 percent of the material thickness which is to be cut is used for over-all clearance between punch and die. Where abnormal breakage of delicate punches occurs, increasing the clearance between punch and die is of material aid in reducing the loss by breakage of these punches. In some cases as much as 25 percent is used. For the general run of work, however, the over-all clearance between punch and die is of the order of 5 to 7 percent of the material thickness to be cut.

Clearance is generally increased as the hardness of the material increases. A notable exception to this rule is the clearance used for quality lamination dies where the clearance is as low as .0001" between punch and die per side, this being done to eliminate burrs as much as possible on the product. The die described in Figure 3 has a clearance of .001" per side between punch and die.

A progressive pierce, part, and bending die of this type is usually made with a channel or box-type stripper. Figure 10 illustrates this construction. The required stripper thickness (x) can be determined from the following formula:

$x = w/3 + 16t$ where

w	equals	width of material strip in inches.
t	equals	thickness of material strip in inches.
x	equals	thickness of stripper plate to nearest eighth of an inch.

For example, the part illustrated in Figure 2 would require a stripper of the following thickness:

$X_1 = 1/8" + 16 \times .025" = 1/8"$.

To X_1 must be added a factor when stripping is performed by a projection on the periphery of the stripper as in the case of the die in Figure 3. For the type

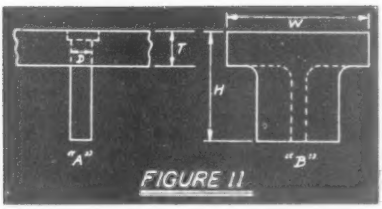

FIGURE 11

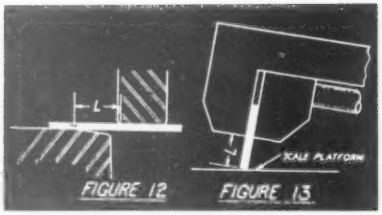

FIGURE 12 FIGURE 13

stripper projection illustrated, it is customary to increase the stripper thickness by 50 percent. Thus the stripper thickness "X" to use in this case would be $\frac{3}{16}$".

The percentage given above is not a fixed quantity and must be tempered with consideration of the amount of stripper projection and size of the work strip. If the strip had been 3" wide, the material thickness .050", and all stripping performed inside the periphery of the stripper, then thickness "X" would be:
X = 3"/3 + 16 × .050" = 1.8 eighths; thus calling for a stripper $\frac{1}{4}$" thick. The stripping tonnage can be ignored when using the formula given above.

Stripping is made necessary because of the elasticity present in metals. When the punch starts to pierce the material, the material "flows" out from the sides of the punch until the shearing strength of the material is exceeded and the slug pops out of the strip. The material then flows back and seizes the punch. As the punch dulls, this outward flowing action increases and, as the slug is pierced out, the seizing action is stronger. Stronger seizing action by the work strip naturally helps to dull the punch even more, and die deterioration proceeds at an accelerated pace. Great care should therefore be taken to insure that dies are kept properly sharpened.

The thickness "T" of the punch plate should be at least from $1\frac{1}{2}$ to 2 times "D" as shown at "A" in Figure 11, and the width of the punch flange should be at least as wide as the punch is high. This is not only true for the die which produced the bracket of Figure 2, but holds for all types of dies utilizing the methods of construction shown. Should it be impracticable to follow these recommendations, it would be wise to guide the particular punches in question, either by a heel, such as was shown in Figure 9, or they should be guided by hardened bushings in the stripper, depending on the particular type of punch.

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$$T = \frac{t \times L \times S}{2000}$$ where

t equals strip thickness in inches
L equals total length of cut in inches
S equals shearing strength of the material in pounds per square inch

Most metal catalogs give only the tensile strength of the material in question. For ordinary ductile steel, brass, aluminum alloys the shearing strength is approximately 70 percent of the tensile strength.

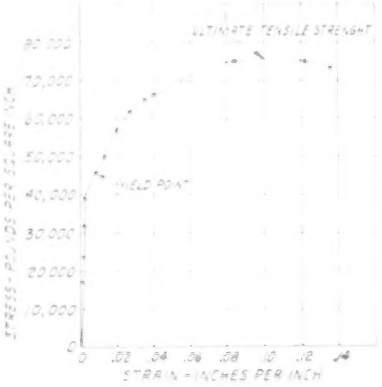

FIGURE 14

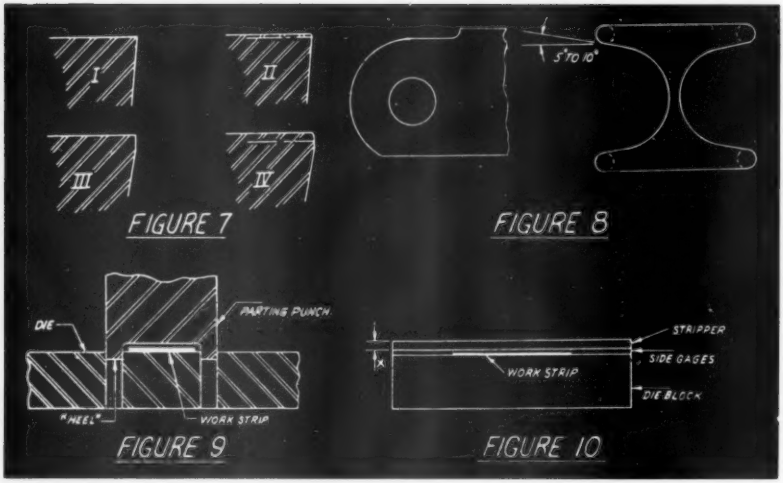

FIGURE 7

FIGURE 8

FIGURE 9

FIGURE 10

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For example, the part illustrated in Figure 2 would require a stripper of the following thickness:

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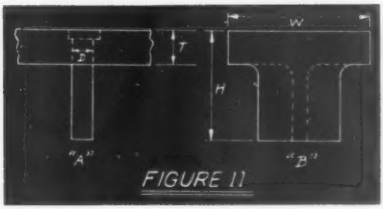

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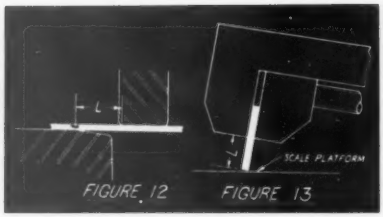

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$X = 3''/3 + 16 \times .050'' = 1.8$ eighths; thus calling for a stripper ¼" thick. The stripping tonnage can be ignored when using the formula given above.

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The necessary tonnage required to produce the bracket of Figure 2 is found by first calculating the force necessary to blank the two holes and part the bracket to its developed length. Then the tonnage required to bend the part to its required shape is determined. The formula used for calculating the tonnage required for blanking, piercing or parting is given below.

$$T_1 = \frac{t \times L \times S_s}{2000}$$ where

t equals strip thickness in inches
L equals total length of cut in inches
S_s equals shearing strength of the material in pounds per square inch

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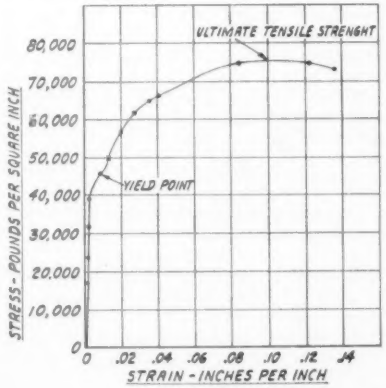

FIGURE 14

Substitution of the following factors will enable us to calculate the shearing tonnage T_1:

t equals .025"

L equals circumference of two pierced holes and both sides of parting cut.
.500" × 3.14 + .500" × 3.14 + 1.000" × 3.14 = 6.28"

S_s equals tensile strength × .70 equals 76,000 pounds per square inch × .70 equals 53,200 pounds per square inch

T_1 equals

$$\frac{.025" \times 6.28" \times 53{,}200 \text{ \#/sq. in.}}{2000}$$

therefore:

T_1 equals 4.2 tons to pierce and part blank

The shearing tonnage T_1 is in practically all cases, for dies of the type being described, much greater than that required for bending and setting the part. Also, since piercing and parting are usually complete before any bending takes place, the bending tonnage for a die of this type is usually not determined. Not determfning this tonnage, however, does not mean that it should be disregarded. In this instance, since parting and piercing take place before bending, the bending tonnage can be ignored.

The tonnage required for bending and setting the part can be found by testing the forming station on a hydraulic press having a pressure indicator. The actual tonnage required to bend up the part is relatively small, the tonnage really being required in order to set the part so that it will hold its shape. For simple bending without "setting", the tonnage required can be determined from the formula given below:

$$T_2 = \frac{t^2 \times w \times S_{yp}}{4000 \times L}$$ where

t equals strip thickness in inches.

w equals width of material strip in inches.

S_{yp} equals strength at yield point of metal in pounds per square inch.

L equals length of moment arm as shown in Figure 12, in inches.

The formula given above is based on the assumption that the bending line is on the centerline of the stock thickness. It is, however, accurate enough for its intended purposes, and can be checked by clamping a part of thin cross section in a diemakers' or other small vise, leaving a length extended from the jaws equal to the moment arm "L" (see Figure 13). This extension of the part is then bent up at a right angle against a scale reading in pounds.

Answers derived from this experiment agree quite closely with those obtained from the formula. The piece must be loaded beyond the yield point before "bending", as differentiated from "deflection", takes place. The stress at the yield point is about 60 percent of the tensile strength of the material and is that point on the stress-strain diagram where a notable elongation of a material under a given tensile load takes place.

Figure 14 is a graph of the stress-strain relationship for a low carbon steel, and the yield point is indicated upon it. The bracket of Figure 2 requires a pressure of approximately 40 pounds for bending; however, a pressure of about 50 times that figure is used to "set" the part.

It can be seen from the formula for simple bending that as the moment arm "L" increases, the tonnage necessary to start the bend decreases. This fact is especially useful when bending parts of heavy cross section where doubling the moment arm will cut in half the tonnage required to start the bend.

Even where increase in the moment arm is not necessary, as in most cases it is not, the type of bending edge shown in Figure 12 is sometimes incorporated into design of the die, since it has a tendency to reduce the amount of "springback" in the legs of the bracket.

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Why Hydraulic Presses?

*Part III****

(*Conclusion*)

by Herbert Chase, M. E.
Forest Hills, New York

For certain types of work, especially for short runs on a variety of shapes and sizes such as are needed for aircraft, for example, the hydraulic press can be used with confined rubber blankets or cushions to take the place of one half of the die, usually the female half. This effects great economies in die construction, besides which several dies of different shape often can be used at the same time in a large press. By saving half a die for each piece, die costs are halved and even the half die required commonly costs much less than half a steel die because dies of soft metal, vulcanized fibre, plastic or even wood or plaster can be used. Often these are cast to shape and need little or no machine work.

Economies realized by this means are extensive. The process is especially adaptable to soft ductile materials but can be applied also to harder materials, such as stainless steel, in thin gages. It might be supposed that crank presses could be used for similar work, but, according to Gordon B. Ashmead, an authority on the subject: "Many punch press conversions (to the Guerin rubber pad process) have been tried but, to date, their success has been negligible. Invariably they rack themselves to pieces in a matter of days if not hours."*

Such failures have been attributed to reaction caused by flow of the rubber when it is unloaded after forming a piece. In the hydraulic press, this reaction is cushioned and causes no ill effects. In short, the hydraulic press is well adapted to this technique and is

**The Modern Industrial Press, Vol. II. No. 4, p 48.*

****Reprints Available***

Readers interested in obtaining reprints of Mr. Chase's three articles, "Why Hydraulic Presses?", may obtain them by using our postage-free Inform-A-Gram. Simply circle Key No. D92.

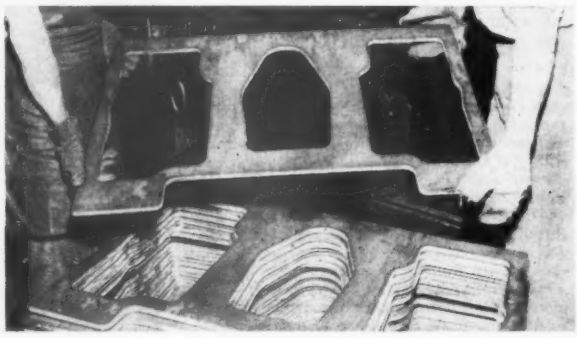


Fig. 11. In the Caterpillar Tractor Company's Peoria Plant, a 3500 ton H-P-M hydraulic press incorporating a 1,000 ton pressure cushion is used to blank heavy parts from ¼" to ⅛" thick stock. An advantage of the hydraulic press in blanking from heavy stock is in obtaining parts so flat as to require no subsequent straightening. This flatness results from using a press equipped with a cushion of sufficient tonnage to maintain a squeeze on the parts being blanked.

Fig. 12. A battery of nine H-P-M "Fastraverse" presses installed in the miliatry aircraft supercharger plant managed and operated by the Allis-Chalmers Manufacturing Company in Milwaukee. Each press is completely self-contained, and is equipped with a hydraulic blankholder and a hydraulic die cushion. The supercharger jobs run on these presses include deep drawing, trimming, flanging, sizing, re-drawing and straightening.

extensively used with noteworthy economy for such work.

Nobody familiar with the variety of work done with dies of many types on the hydraulic press will be disposed to question its versatility. Use is not confined by any means to drawing operations . Many jobs of blanking are done, some on sheet up to ⅞-in. or greater thickness and where the results secured are considered superior to those on mechanical presses.

Piercing and coining operations are also performed as, for example, in multiple piercing and coining the edges of holes in steel spinner baskets for washing machines, using steel that is later vitreous enameled. Uncounted other piercing and coining operations might be mentioned and blanking is similarly performed.

Embossing is done on a large scale, some of it quite deep, as in producing refrigerant passages in the plates used for making evaporators for domestic electric refrigerators. Multiple U-shape convolutions thus formed involve severe working that would be likely to rupture metal if attempted in crank presses. Bending and forming operations are also performed efficiently.

As previously pointed out, hydraulic presses are outstanding performers in drawing operations and do many jobs of deep drawing with results better than are attained on crank presses. Scrap losses are lower, and metals worked only with great difficulties (if at all) on

Fig. 13. The stainless steel, nozzle box rear shell is one of the largest parts of the turbo-supercharger. Here it is being drawn on a 400 ton H-P-M "Fastraverse" press equipped with 150 ton blankholder and 50 ton hydraulic die cushion. The press bed is 60" x 48". The blank (26" x 32" x 1/16") is drawn to a depth of 4½". Pressures required to produce this difficult draw are: punch, 400 tons; blankholder, 138 tons (38 tons each on two rear rams, 31 tons each on two front rams); die cushion, 18 tons. This stainless steel blank is drawn from flat blank to final form without wrinkling or tearing in fifteen seconds, actual press time.

crank presses are effectively drawn on H-P-M presses, partly because the rate of drawing is so controlled that shock is avoided and the metal has time to flow as required.

According to Walter J. Camp, Supervisor of Design, Caterpillar Tractor Co., "A principal advantage of blanking heavy sheet steel parts in the hydraulic press is the high degree of flatness obtained if certain rules are observed. Parts that do not require straightening before assembly reduce manufacturing cost materially."* Figure 4 shows the blanking of heavy sheet stock at the Caterpillar plant.

Safety—a most important consideration in modern industry—is high with H-P-M presses and this applies not only to operation but to the press itself, to dies and to work.

On crank presses, the cycle is usually of fixed duration and, once the press is tripped, it commonly runs through its cycle regardless of anything the operator can do. This makes necessary somewhat elaborate safety precautions.

With the H-P-M press, the press cycle can be stopped or automatically reversed almost instantly at any point desired, and it will not repeat. These are clearly advantages from a safety angle as is also the fact that there is no dependence upon flywheel inertia that is primary cause for accidents in crank presses.

Better control of dimensions is often obtained with the hydraulic press, presumably because application is controlled and sufficient time is allowed for the metal to flow and the piece to set to the required size. In any event, some press shops report less spring-back when the hydraulic press is used.

With the hydraulic press, if a bottoming die is used, the pressure applied against the bottom is always the same (for a given pressure setting) even though the thickness of stock from piece to piece varies somewhat. This is not true in crank presses because they have a positive stroke and pressure against the bottom varies if metal thickness varies from blank to blank.

In drawing, as previously explained, the H-P-M hydraulic press applies the same clamp ring pressure for each piece, regardless of changes in thickness, but in mechanical presses this pressure varies (unless it uses an air cushion or hydraulic means to apply the pressure) and this, in turn, affects the draw and is likely to cause dimensional variations.

"A crank-actuated punch does not pause even momentarily at the bottom of its stroke; a punch actuated by fluid-pressure can be made to dwell at the limit of its descent, under full pressure, for as long a period as may be desired. In certain instances this 'dwell' has been found to be helpful in producing shapes having the desired dimensions and contour because it prevents, or at least rereduces, the 'spring back' which follows the immediate release of pressure from a cold-pressed metal shape."*

American Machinist, March 14, 1946.

Conclusions

The foregoing advantages of hydraulic presses constitute sound reasons for their choice for a wide variety of work. That the advantages—far from being mere sales claims—are supported by engineering facts and shop experience has been made clear in foregoing details.

Many press shops heretofore equipped only with mechanical presses are introducing the hydraulic type and employ it not only for routine work but for the deep and intricate draws where the hydraulic press has proved superior.

A typical example to substantiate this conclusion is the case history of an H-P-M hydraulic press application at Buick Motor Div. of G.M.C. for drawing rocker arm covers. "Because of the success attained and the substantial savings that result from reduced scrap and elimination of repairs on the drawn covers, more extensive use of hydraulic presses is being considered. For example, the Buick engine oil pans which are much larger parts and require deeper draws, may be transferred to hydraulic presses. Similar economies are anticipated for much the same reasons, even though the shape of the drawn oil pan differs substantially from that of the rocker arm cover."**

Jevons: The Metallurgy of Deep Drawing and Pressing.
**The Iron Age, 1/15/48, p 84.

Fig. 1. A well-scarfed joint is essential to successful silver-soldering. The steeper the angle and the longer the scarf, the better the joint. The blade has teeth all the way around, is extremely sharp and springy, so for safety's sake, wear gloves when grinding.

Silver-Soldering Spiral Saws

by Alexander Maxwell
Chicago, Illinois

Up till now the only convenient way to purchase the new and highly desirable spiral tooth bandsaw blade was in cut lengths, already welded. The reason was quite obvious, the blade stock did not weld worth a hoot in a buttwelding machine designed for the more conventional strip stock blades.

It now develops the blades as supplied by the manufacturer never were welded; they were silver soldered. When skillfully done, a silver solder job is as strong as the metal it unites and in some respects it is superior, because the carburizing, case hardening, tempering or other unwanted and largely uncontrollable altering of molecular structure caused by the fusing heat of a welding arc is completely eliminated. The conventional welded joint must be carefully annealed to withdraw whatever action has been set up. An unannealed joint is brittle as glass and hard as a file.

It also develops the silver soldering was not done with an acetylene torch, not with a blowpipe, but with a buttwelding machine, the very same machine used to join the conventional type of blade. The operation is far from complex, but it is just "touchy" enough to offer a

Photos courtesy the DoALL Co.

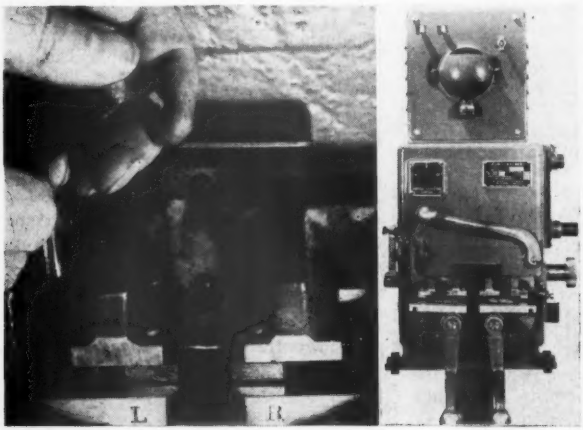
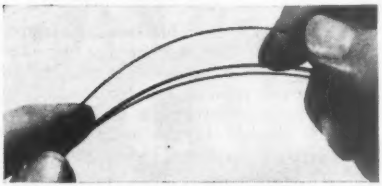


Fig. 2. Close-up of scarfed ends of spiral blade clamped in jaws of buttwelding machine. The scarfs must register accurately and be in firm contact. If well ground, the joint will be quite inconspicuous. The silver-soldering flux is a simple mixture of "20-Mule" borax and distilled or fresh rain water. Solder in strip form is easiest to apply. If only wire form is available it should be hammered as flat and thin as possible. Several silver solders are available. For this application, a desirable solder is one which contains 50% silver with the balance copper and zinc. This melts at 1400° F.

Fig. 3. A perfect job results from the solder flowing into and around the joint. The bonding will amount to less than .010" when the proper amount of solder is used.



challenge to the would-be silver soldering technician.

First the joint must be scarfed on a grinding wheel, Figure 1. As the blade has teeth all the way around, is sharp as a razor and on the springy side, wear gloves when grinding. The steeper the angle and the longer the scarf the better. Dip frequently and avoid burning. Stock as small as a spiral blade goes blue almost without warning. Get both laps of the scarf straight and parallel.

The two ends are now clamped in the jaws of the buttwelder, Figure 2. The scarfs must register and be in firm contact. If well ground, the joint will be hard to see. Flux is a mixture of borax and water fluffed up to a creamy paste. Borax is simply the "20 mule" variety. If your tap water contains even a trace of iron it is liable to cause trouble. Use distilled or fresh rain water. There are a number of silver solders available. One, containing about 50% silver with the balance copper and zinc, will melt at 1400° F. This is full cherry red, just the place where annealing starts. It is well below the fusing point of steel. Obtain silver solder in thin strips, if possible. If only wire is available, hammer flat and as thin as possible.

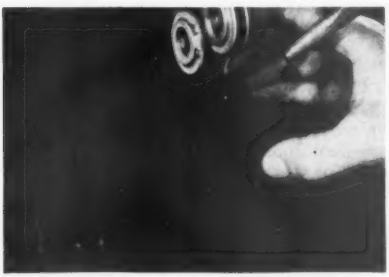


Fig. 4. A typical toolmaking application of the spiral saw blade.

With the scarfed joint firmly clamped and fluxed, snip off a piece of solder and wind it tightly about the joint. Do not use the welding heat. Set the annealing temperature at soft and press the contact button gently and intermittently until all moisture is driven from the flux. Now turn to high, and bring the blade temperature up to cherry red. Juggle the button to hold temperature here. If it rises the blade will sag, if it falls the solder will refuse to melt. That is what we mean by "touchy". When the solder melts, it goes fast and appears to vanish in thin air. Keep the heat going for several seconds after the solder is gone, then switch back to medium, then soft, bringing the joint down slowly. Allow to cool to room temperature before disturbing.

The solder did not vanish after all; it flowed into and around the joint, making a bonding union. If it lumps up higher than the teeth, grind down. If the job was done right and the proper amount of solder used, the bonding will be less than .010", Figure 3.

If the blade is to be cut, select a place at least three inches from the soldered joint. Most steels cannot be silver soldered twice in the same place. The number of joints permissible in a blade is determined by the point where it will no longer go over the wheels of the saw.

If the blade is dirty or oily, clean before soldering. Alcohol, caustic or dilute muriatic acid is suitable. If a cleaner is used, wash well before applying borax flux.

The ability to thus "weld" your own blades not only increases the versatility of your saw, it enables you to take advantage of the savings effected by the purchase of bulk coils of saw blade.

JAY CRESWELL, President of Pneumatics Incorporated of Plymouth, Ind., has purchased control of the Anker-Holth Manufacturing Company of Port Huron, Mich. This gives Pneumatics Incorporated a complete line of air and hydraulic cylinders.

New Developments in Tools Steels*—*Part III*

Tempering Charts

A recently published development in the field of high speed steels may be of benefit to heat treaters who are constantly faced with the problem of selecting a suitable tempering cycle to obtain a specific hardness. Hardness charts, which differ from the normal tempering curves in that they show the relation between tempering temperature and tempering time to produce a certain hardness level, are available for three common high speed steels and an example is shown in Figure 9.

This chart shows the effect of tempering upon a tungsten-molybdenum high speed steel which has been hardened from 2225° F. and which has, in the as-quenched condition, a grain size by the intercept method of 10 and a quenched hardness of 64.7 Rockwell C. The tempering temperature is plotted vertically

by George A. Roberts
Chief Metallurgist
Vanadium-Alloys Steel Co.
Latrobe, Penna.

and the tempering time is plotted horizontally in hours. The horizontal scale is spaced in a logarithmic manner. Heavy diagonal lines in the chart connect those tempering cycles which will produce Rockwell C hardnesses shown at the ends of the lines. A separate constant hardness line is drawn for each hardness level above 60 Rockwell C and lines are drawn for lower hardnesses at 58, 55, 50, 45 and 40 Rockwell C. In the lower left-hand corner of the chart numerals indicate the minimum hardness obtained by tempering below the point at which secondary hardening begins. Proceeding from this section up and to the right the hardness increases to the zone of maximum secondary hardness. This zone is bounded by two lines having the same hardness values, and tempering within the zone will produce maximum hardness shown by the numerals therein. Proceeding further in the same direction, the hardness decreases in a regular manner.

As an example of the use of these charts, let us assume the manufacture of a cutting tool from a tungsten-molybdenum high speed steel with a specification calling for a final hardness of 62 to 63 Rockwell C. The hardening is performed in a salt bath operating at 2200 to 2210° F. and the hardness is 64.5 Rockwell C in the quenched condition. With an intercept grain size normally obtained from such operating conditions of from 10 to 11, this treatment is equivalent to that obtained in a semi-muffle furnace from 2225° F. and Figure 9 is applicable.

For maximum mechanical properties it is best to obtain a hardness of 62 to 63 Rockwell C by multiple tempering at a temperature above that which yields maximum secondary hardness and from Figure 9 any of the following cycles may be selected:

Tempering Temp. °F.	Total Tempering Time, Hours
1050	14 – 25
1075	7 – 14
1100	4 – 8
1125	2 – 4.5
1150	1.2 – 2.5
1175	0.6 – 1.5

From practical considerations it is preferred to select a temperature which will place the tempering time within convenient limits and most commercial operations of this sort are conducted by tempering for from 1½ to 3 hours for each of two cycles. Thus, the following may be selected as ideal for the job in question:

First Temper—2½ hours at 1100° F.

Second Temper—1½ to 2½ hours at 100° F.

*Part II, TDJ, August, 1948

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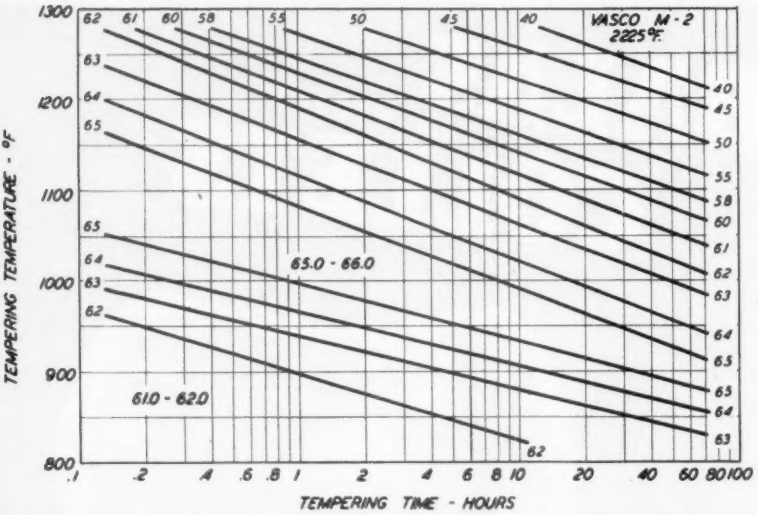

Fig. 9. Tempering Chart for Tungsten-Molybdenum M-2 Type High Speed Steel. Oil Quenched from 2225° F. As-Quenched Hardness 64.7 Rockwell C. Intercept Grain Size 10. Numerals on chart indicate Rockwell C hardness values. G. A. Roberts and A. H. Grobe, Vanadium-Alloys Steel Company.

It is desirable to use the shortest of the indicated times from the iso-hardness charts to avoid the danger of oversoftening the material because of variations in hardening conditions of high heat furnaces and because of differences in the heating rate of tempering furnaces and the inability to judge accurately the actual time at temperature. It is inadvisable to use too short a tempering time because of the inability to estimate the time at which the steel reaches the tempering temperature, especially if larger sections are being treated. It is therefore recommended that an absolute minimum tempering time of 1½ hours be employed.

Bainitic Treatments

Recently attention has been given to bainitic treatments as applied to high speed steel. A typical treatment involves preheating and austenitizing in the usual way and quenching in oil or in a neutral salt bath. The steel is removed from the quenching bath when still hot

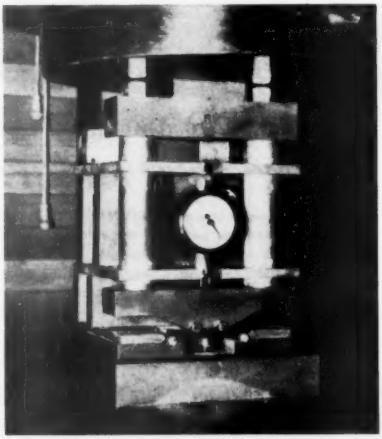

Fig. 10. Jig used in conducting bend tests on hardened tool steels showing dial gauge for measuring deflection of sample.

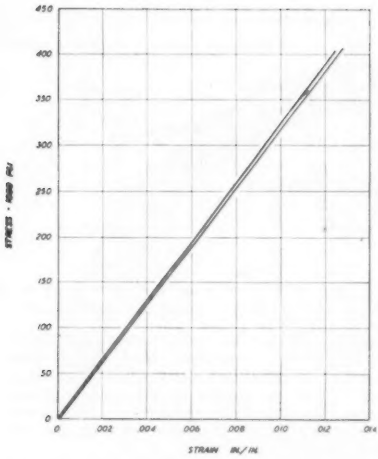

Fig. 11. Stress-strain curve of elastic region as calculated from the load-deflection reading obtained in the bend test of hardened 18-4-1 High Speed Steel.

and placed in a furnace or bath operating at 500° F. After holding at 500° F. for 4 hours the temperature is advanced to 1050° F., held at this temperature for 4 hours and then again cooled to 500° F., where another 4-hour treatment takes place.

After cooling to room temperature the steel may then be double tempered in the usual way. The object of this long heat treating cycle is to produce tempered bainite in amounts up to 80 percent instead of tempered martensite. Obviously the long cycle is advantageous in reducing the level of residual stresses.

Cutting tests performed on tools given this treatment are inconclusive but in certain instances they show that an improvement in cutting life may be expected. Other tests have not shown an improvement and the application of the treatment will probably remain specialized for certain applications. It would undoubtedly find greater application but for the exceptionally long times of treatment involved which may be considered by many as prohibitive.

Bend Tests

A recent development in the testing of tool steels has been published in which a critical study of the mechanical properties of high speed steels was made by means of the bend test. The jig used to test specimens .140" x .500" in cross-section and 2" long is shown in Figure 10, and Figure 11 illustrates a typical stress-strain curve calculated from the load and deflection readings. The stress referred to is the tensile stress occurring in the outer or bottom fibers of the test sample. Four properties can be measured by this test, namely, the bend strength, the yield strength, the total deflection and the plastic deflection.

As an example of the application of this test to high speed steels, Figure 12 shows the effect of tempering temperature upon the yield strength, bend

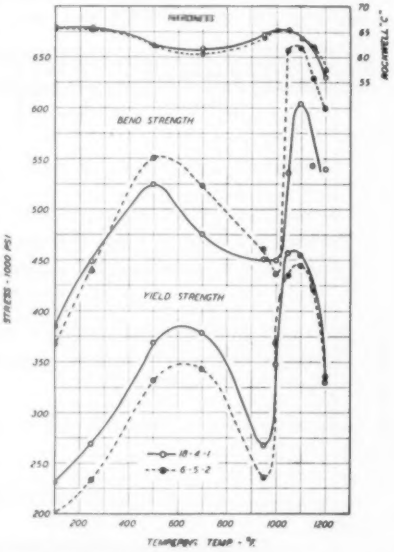

Fig. 12. Effect of tempering temperature upon the Yield Strength, Bend Strength and Hardness of Tungsten (18-4-1) and Tungsten-Molybdenum (6-5-2) High Speed Steels. 18-4-1 oil quenched from 2350° F., 6-5-2 oil quenched from 2225° F. Tempering time 1 hour. A. H. Grobe and G. A. Roberts, Vanadium-Alloys Steel Company.

strength and hardness for both an 18-4-1 and a tungsten-molybdenum high speed steel. Figure 13 charts the effect of tempering temperature upon the two deflection values obtained in the test. In applying this information it is suggested that particular attention be given to the yield strength since with tools and dies relatively little plastic deflection is permissible in service and the stresses must, therefore, in general, be held to values under the yield strength.

Carburization of High Speed Steel

The final development, while not new, is receiving wide attention as a successful treatment for blanking, trimming and forming dies where high speed steel is employed. Pack hardening methods for high speed steel have been used for many years in certain instances. In many cases the purpose of this treatment was to protect the surface rather than to increase the life of the tools and dies through controlled carburization. Procedures have now been developed whereby accurate control of a pack carburizing is possible. The packing medium normally employed is charcoal and the temperature for all grades of high speed steel is 1950° F. The holding time at this temperature ranges from 20 to 40 minutes and cannot be too long since excessive carburization may cause surface pitting. Figures 14 and 15 illustrate the effect of this carburizing treatment on the hardness of the new 1.50% carbon, 5.00% vanadium high speed steel as a

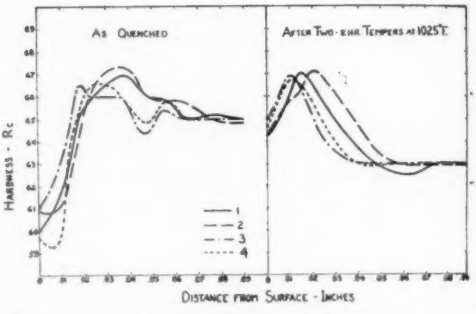

Fig. 14. Effect of carburization of 1.50% Carbon, 5.00% Vanadium High Speed Steel (Vasco Supreme) upon the hardness at various depths from the surface in the quenched condition and after double tempering. Carburized in charcoal for 40 minutes at 1950° F. and oil quenched.

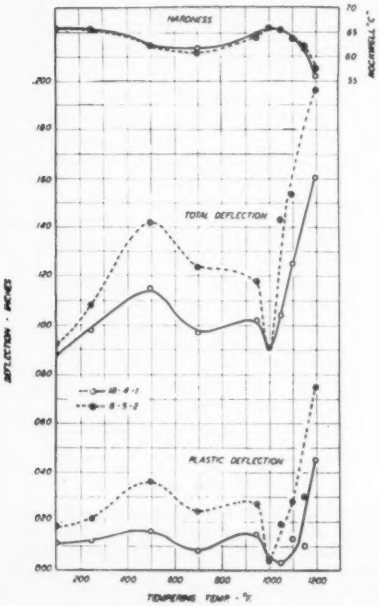

Fig. 13. Same as Figure 12 but showing Plastic Deflection and Total Deflection.

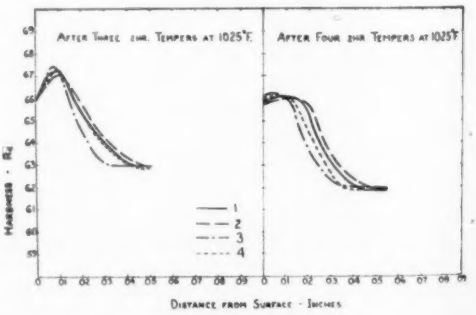

Fig. 15. Same as Figure 14 but after three and four tempering treatments, respectively.

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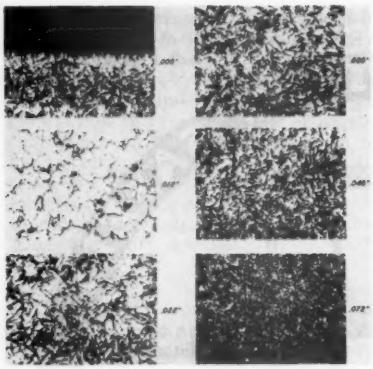

Fig. 16. Microstructures across the carburized zone of 18-4-1 High Speed Steel. Carburized 8 hours at 1750° F. Oil quenched from 2200° F. Tempered 2½ hours at 1050° F. Depth from surface indicated in illustration.

function of distance from the die surface. The first illustration applies to the quenched condition in one part and to the hardness after a double temper in the other part. The second illustration applies to three and four tempers respectively for each part. Figure 16 illustrates the microstructure of a heavily carburized but not completely tempered high speed steel sample. The six inserts refer to structure at the indicated depths from the die surface. The extent of carburization in this sample is considered excessive for most applications and is shown here for illustrative purpose only. Carburization causes additional quantities of retained austenite and for maximum results it is recommended that multiple tempering be employed.

* * *

New Resident Manager

Norton Company, Worcester, Mass., recently announced the appointment of George C. Gibbons as Resident Manager of the company's bauxite plant in Bauxite, Ark. The appointment became effective August 1, 1948.

Improved Gear Shaving

All the improvements in the practice of gear shaving developed over the last few years have now been consolidated in one machine which can shave by either the diagonal or conventional method. Known as the "Red Ring" Universal Diagonal, the machine is manufactured by the National Broach & Machine Company of Detroit, Michigan. The Universal Diagonal will handle any conventional shaving operation and at the same time it will give the Elliptoid tooth form by rocking the table as it is being reciprocated. The degree of crowning and the position of crown are both selective. Gears with face widths up to 2" can be shaved with diagonal table traverse. This diagonal shaving materially reduces shaving time, prolongs cutter life, facilitates the shaving of shoulder gears and reduces both loading time and operator fatigue. Gears being shaved diagonally can also be crowned by rocking the table with adjustable cam—the same as the conventional shaving. For details write National Broach & Machine Co., Dept. 39, 5600 St. Jean Ave., Detroit 13, Mich., or circle **Inform-A-Gram Key No. D90.**

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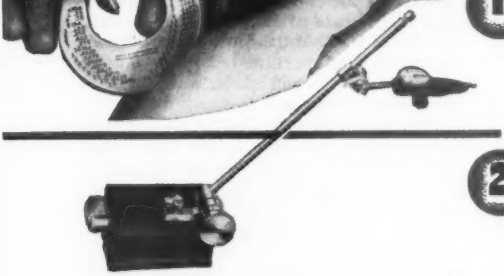

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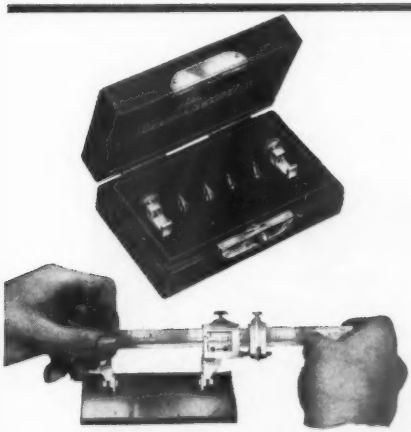

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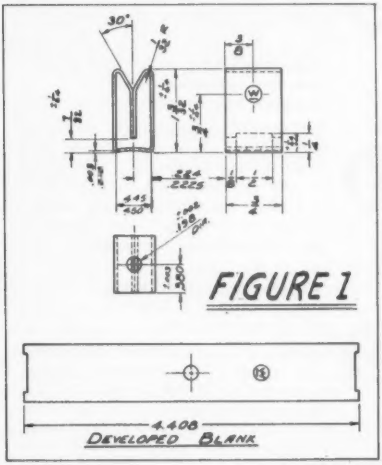
Multi-Slide Tooling for Westinghouse Terminal Clips

High production requirements for terminal clips to be used in outdoor watt-hour meter sockets has led to the installation of U. S. Multi-Slide Machines at the Meter Division of Westinghouse Electric Corporation, Newark, N. J.

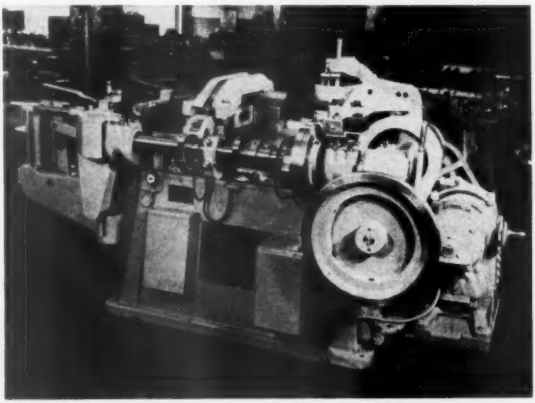


The clip, as shown in Figure 1, had originally been produced on a battery of presses, each with its own operator. This method of operation involved secondary handlings with resultant lost time and increased cost. Westinghouse now makes the clip complete in one operation, at the rate of 80 per minute, using the No. 33 U. S. Multi-Slide illustrated in Figure 2. The machine is equipped with one die head, cut-off slide, and the appropriate cutting and forming tools.

The Multi-Slide has a shaft system around the four sides of the bed. The shafts are joined at the corners by means of miter gears made of special alloy steel. Power is applied to the camshaft system through gears. The horizontally operated die head, forming slides, and feed mechanism are actuated from the shafts by suitably designed cams and eccentrics. Smooth starting of the machine is accomplished by means of a clutch, no gears being disengaged. The flow of power is smooth, as the operations are so timed that they are well distributed and do not occur at a given instant as is the case in conventional presses.

Fig. 1 (above). The dimensional requirements and developed blank for production of the Westinghouse terminal clips used in outdoor watt-hour meter sockets. The clips were originally produced on a battery of presses, involving secondary handlings with resultant lost time and increased cost.

Fig. 2 (right). The No. 33 U.S. Multi-Slide machine on which Westinghouse now makes the clip complete in one operation at a rate of 80 per minute. The machine is equipped with one die head, cut-off slide, and the appropriate cutting and forming tools.



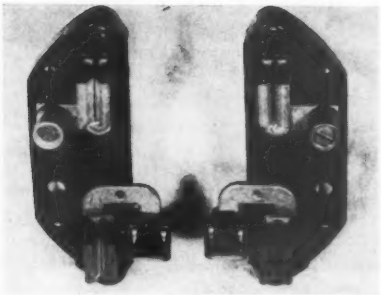


Fig. 3. The terminal clips shown above mounted on the molded insulation bases prior to final assembly. At the right they are shown mounted in the outdoor socket shell.

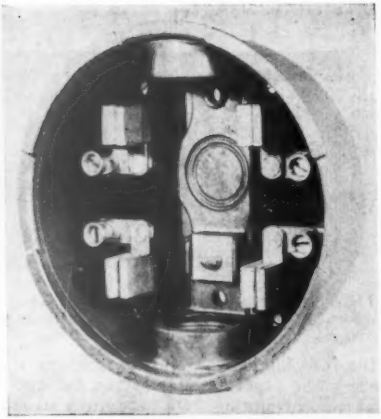
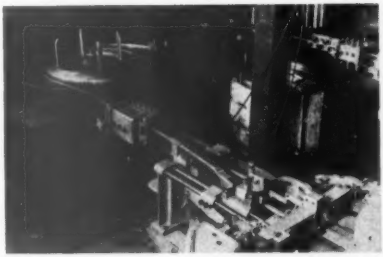


Fig. 4 (right, below). The clips are produced from bronze strip in coil form mounted on a U.S. Automatic Stock Reel. A loop is maintained between reel and dies to eliminate whipping and to attain efficient feeding.



The Multi-Slide used in the production of the Westinghouse terminal clip is equipped with an automatic lubrication system, variable speed drive and a 5 hp motor. In connection with the tooling employed, an important feature is the use of built-up die sections, placed in die sets, permitting easy adjustment or change of individual punches or dies to conform to modification in the design of the parts being made.

Operations such as cutting, piercing, trimming, swaging and embossing are performed by means of the die head. The final shaping of the piece is accomplished by means of the four cam-operated forming slides. Forming tools are mounted on the slides by means of tool blocks which are easily removable.

The rigid conductivity requirements for the Westinghouse terminal clip are met by the use of bronze material containing 94 to 96% copper. Before being assembled into the watt-hour meter, the clips are tin plated. Figure 3 illustrates the assembly of the clips in the watt-hour meter. The clips undergo a strict inspection which allows no temperature rise in excess of 55° centigrade ambient at 120 amperes. After repeated blade tests, the terminal clip must maintain specified contact and tension.

In the production of the clip in the U. S. Multi-Slide Machine, material in coil form is used. The coil is mounted on a U. S. Automatic Stock Reel of the type shown in Figure 4. This reel is individually motor driven and is arranged with a mercury switch control to provide a loop of material between the reel and the machine. The maintenance of the loop eliminates troublesome "whipping" and aids in obtaining efficient feeding. The feed mechanism of the Multi-Slide is also shown in Figure 4.

From the reel the stock is fed through the machine's flat stock straightening rolls. New coils are inserted without disturbing the setting of the straightening rolls. Figure 4 shows stock being pulled through straightening rolls by the feed. Operating between definite stops,

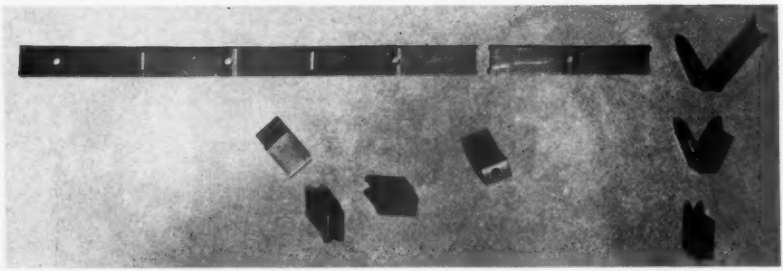


Fig. 5. A strip of the bronze stock showing the operations performed in the die head; a blank after separation from the strip; and pieces in the preliminary and final forms.

the feed is always accurate, pushing the stock the exact amount of the flat blank at each revolution. On the return stroke, a cam-operated check insures precision feeding by preventing movement of the stock.

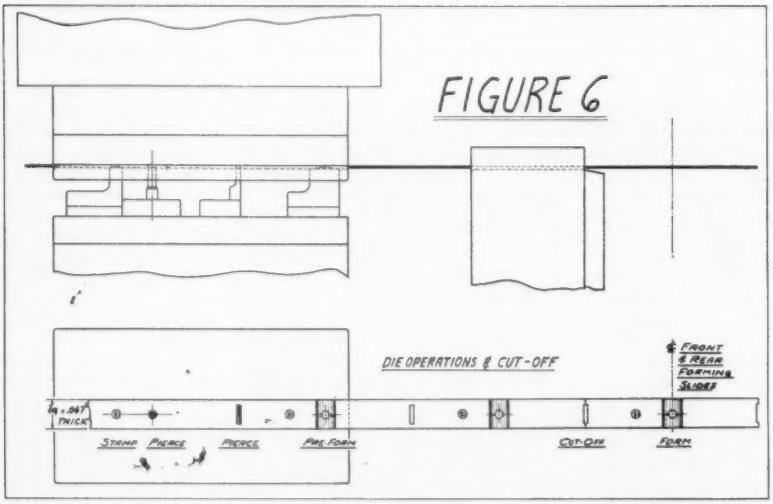
In order to reduce die wear, the material is lubricated before being fed into the die.

Figure 5 shows a strip of material indicating the operations performed in the die head. Also shown is a blank after separation from the strip and a number of parts in the preliminary and final forms. Above the strip is shown the sub-assembly ready for mounting in the watt-hour meter socket.

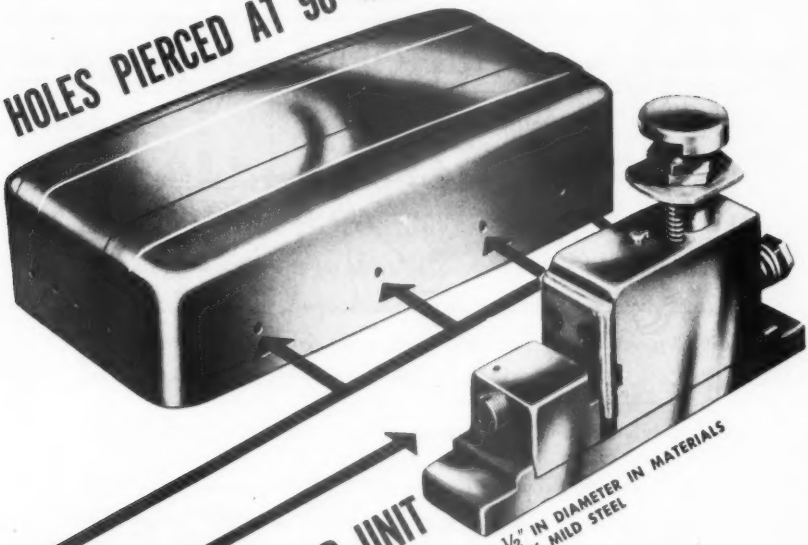
The operations performed in the die head are: stamping Westinghouse initial, piercing of the round hole, piercing of the elongated slot and performing the concave section in which the round hole is pierced.

The actual shaping of the clip is a complicated operation and is handled in three forming levels. The die head and

Fig. 6. The stamp, pierce, pre-form and cut-off operations prior to forming the clip.



HOLES PIERCED AT 90° ANGLE...



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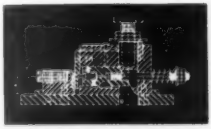
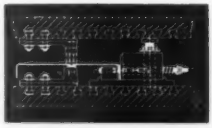


Detailed drawing showing operation of HU-50 90° Perforating Unit.



Typical set-up shows 90° perforating unit operated in conjunction with standard perforating equipment.

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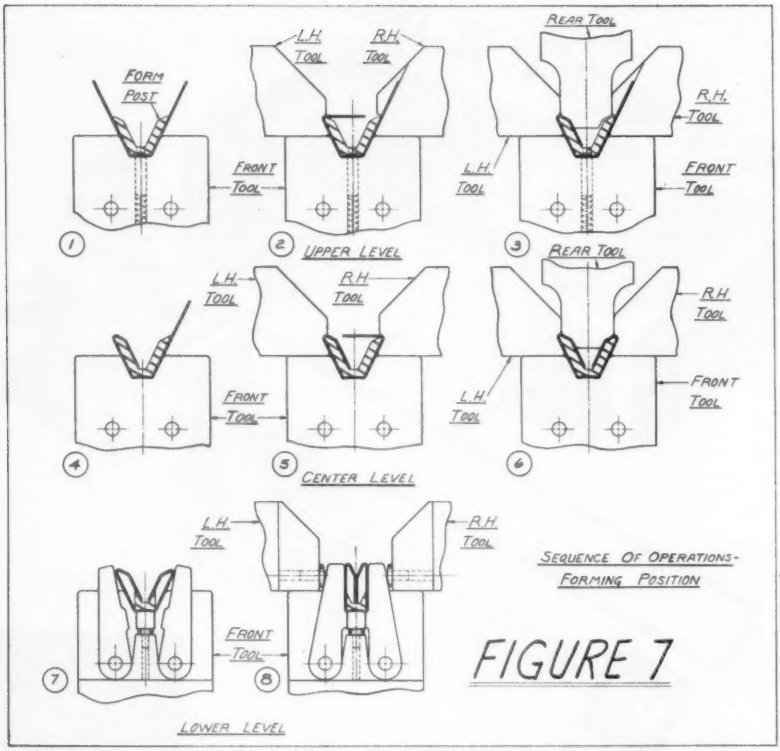

Fig. 7. The eight successive operations that give final form to the terminal clip.

forming operations are indicated in Figure 6 and 7.

After passing through the die, Figure 6, the blank is separated from the strip by means of the cut-off unit. It will be observed that the cut-off is made through the center of the elongated slot, leaving no slugs.

Inasmuch as the material being fed into the machine is of the exact width required for the part, the scrap loss on the entire job is only that resultant from piercing the round hole and the elongated slot.

After cut-off, the blank is immediately picked up in the upper level of the forming position. In the forming position, Figure 7, the sequence of operations is as follows:

1) Simultaneously with cut-off, the part is picked up with front forming tool and formed to "U" shape.

2) Left-hand leg bent as shown with left-hand forming tool.

3) Left-hand leg finish-formed with rear forming tool.

4) Part as formed in (3) transferred to center level.

5) Right-hand leg bent as shown with right-hand forming tool.

6) Right-hand leg finish-formed with the rear tool.

7) Part as formed in (6) transferred to lower level.

8) Part closed to finished shape and size by movable jaws (on front tool)

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which are closed by movement of the left- and right-hand tool as indicated.

In the upper level, one leg of the clip is formed and the other is partially formed. Simultaneously with the return of the feed and the opening of the tools for the next stroke, the stripper mechanism transfers the partially formed blank from the upper level to the center forming level where the second leg of the clip is completely formed. It will be noted that in this position both legs of the clip are formed but have not been closed to the required shape.

The closing of the two legs is accomplished at the next stroke of the machine when the stripper mechanism transfers the partially formed blank in the center forming position to the third and lower level, where the closing of the two legs of the clip is accomplished.

At all times, three blanks in various stages of completion are in the forming position, one above the other. Each part is transferred to the lower level and the finished form is automatically stripped from the post by the part above. With this type of setup a completely formed clip is produced at each stroke of the machine.

1948 • Metal Show • 1948

30*th* Annual National Metal Exposition and Congress to Salute Alloy Steel

A "Salute to Alloy Steel", in celebration of the seventy-five years of progress made in alloy steel, will be the central theme at the National Metal Congress and Exposition when the American Society for Metals holds its 30th annual convention in Philadelphia, October 25-29.

Principal features of this diamond jubilee for alloy steel will be: (1) A program of technical and historical papers about alloy steel. (2) Presenting of "Distinguished Service Awards" to individuals who have made outstanding contributions to the progress and development of alloy steels. (3) A dramatization of the part played by alloy steels in the history and development of our country. This third feature will include graphic evidence of the dependence of American economy on alloy steel, as well as the progress of alloy steels in relation to the engineering, research and technology utilized in their development.

Three important committees, in each case composed of men who represent both the producing and consuming industries in alloy steel, have been chosen to work out the program of the celebration. One committee, consisting of presidents of steel companies and manufacturing associations—the latter covering Aircraft, Automotive, Electrical Equipment, Farm Equipment, Machine Tools, Petroleum, Railroads and Iron and Steel Institute—will serve with representatives of Government, all large users of alloy steels, as the honorary committee.

The second committee will act on the awards to living individuals who can justifiably be honored for their contributions to the progress in the realm of alloy steels. This committee will consider nominations submitted to it and select the outstanding men in all branches of alloy steels.

The third committee's responsibility will be that of dramatizing the history and progress of alloy steel through a visual display of products, applications and services. The last named feature of alloy steel's diamond jubilee will include a dramatic display of alloy steel products, illustrating the use of these important steels in providing many of the higher living standards we now enjoy.

The Metal Congress and Exposition, of which the "Salute to Alloy Steel" is to be the central theme, will provide thousands of visitors to the October Convention with a spectacular display of many new developments in all phases of metallurgy. Many new products and processes will be shown for the first time during the Congress and Exposition.

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"All-Depth" Drills for Shallow and Deep Hole Drilling*

Part II

Machines

Best results are obtained at present with carbide all-depth drills when used on regular "gun drilling" machines since these are designed for the use of stationary type drills. However, a pressure gage should be attached to the drill feeding slide to determine whether the oil pressure is high enough to maintain a uniform rate of chip flow.

by Fred W. Lucht
Development Engineer
Carboloy Company, Inc.
Detroit, Mich.

The all-depth drill, due to its design, is self-guiding in the work. Its usual tendency, therefore, is to follow the general direction in which it has been started. Therefore, the drill guide bushing in the combination drill-guide-and-work-support is one of the most important parts of a drill setup. The more important details in connection with the drill guide bushings are shown in Figure 8. The bushing itself should be hardened and ground, and should run freely in an anti-friction bearing. For best results, the drill should be guided through the bushings and fed into the work while the work is rotating at the correct cutting speed.

If a guide bushing is made for a particular drill size, a mating plug should also be prepared. The guide bushing should be checked for accuracy with this plug at frequent intervals. When worn too badly, the bushing should be replaced.

As shown in Figure 8, the revolving guide bushing is forced against the workpiece under spring pressure and revolves with the work. This helps get the drill started properly. After the drill is in the hole, it is self-guiding. A drill, as ground, really has a floating action in the hole because all of the unbalanced cutting forces are neutralized by the wear strips. The wooden wedges, also shown in Figure 8, are driven into the guide bushings to dampen drill vibrations.

Fig. 8. More important details in connection with drill guide bushings. Revolving guide bushing is forced against workpiece under spring pressure and revolves with the work. Wooden wedges are driven into the guide bushings to dampen drill vibrations.

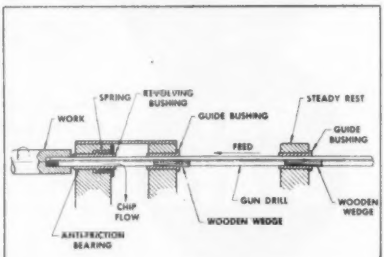


FIG. 8

*Part I Published in TDJ, June 1948.

Cutting Fluids

A cutting fluid serves four main purposes when used with a carbide tipped all-depth drill:

1. It removes the drill chips.
2. It lubricates the wear strips.
3. It lubricates the cut.
4. It acts as a coolant.

Removal of the drill chips is the most important factor. The fluid, forced under high pressure through the entire length of the drill into the annular-shaped groove ("A", Figure 9) produced by the drill and then out through the V-shaped drill flute, washes the light, fluffy chips through the drill flute to the open end of the drilled hole and so into the chip duct.

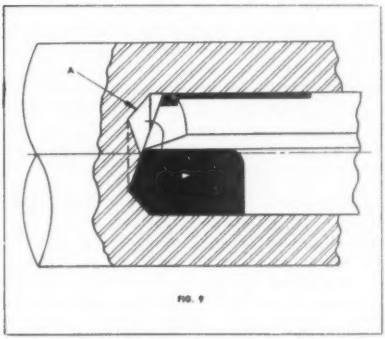


Fig. 9. Chip flow through all-depth drill. The fluid, forced under high pressure through the entire length of the drill into the annular-shaped groove produced by the drill and then out through the V-shaped drill flute, washes the light, fluffy chips through the drill flute to the open end of the drilled hole and so into the chip duct.

The oil pressure should always be high enough to keep the chips flowing continuously away from the cut. Working range of oil pressures for various carbide drilling jobs varies between 300 and 800 pounds per square inch. The actual oil pressure for a given job varies with the drill size, depth of the drilled hole, and rate of feed. If the chip flow becomes intermittent, or if the chips coming out of the drill are packed together in a shape conforming to the drill flue cross section, this is usually an indication that the oil flow is too low. Pressure should be increased at once.

An advantage of using the gun-type design for the all-depth drill is that it makes possible the drilling of very deep holes without continuously withdrawing the drill to remove the chips.

The capacity of the oil pump, of course, should be large enough to keep the oil pressure at the required level and hence maintain a uniform chip flow. Experience to date indicates that the oil pump used when carbide drilling should be powered by a motor equal in size to, or even slightly larger than, the motor required to drive the drilling machine itself.

Experience has also shown that a direct drive or a chain drive is preferable to V-belts for driving the pump since possible slippage is eliminated. Oil filters may be placed ahead of the pumps to protect them from wear which could be caused by minute chip particles carried through the chip screens. More efficient performance is also obtained if the oil is kept reasonably cool, either by means of cooling coils or by use of a large sump tank.

Both soluble oils and cutting oils have been used for carbide drilling. The indications to date have been that the cutting oils develop a smooth, springy type of chip which has a minimum tendency to pack in the drill flute. They also leave a keener cutting edge. In contrast, the soluble oil solution gives an exceedingly crisp type of chip which has a scored appearance. This chip causes increased wear on the cutting edge.

It has been considered best practice to use a sulphur base oil from 10% base for this type of drilling. This type of oil can be purchased from any of the leading cutting fluid manufacturers.

Cutting Speed

Carbide drilling experience on steel indicates that the work being drilled should be rotated at an RPM which will give a cutting speed, at the outside

diameter of the drill, ranging between 130 and 350 SFPM. It is suggested that a new job be started at from 200 to 250 SFPM and the speed varied in either direction until a satisfactory balance between drill life and the feed rate is obtained. Proper balancing of work hardness and cutting speed must be considered, as in any other machining operation.

Most of the "gun drilling" type machines available have been designed primarily to cover the lower end of this speed range, the range used for high speed steel drills. This means that the top speeds of which the machines are capable will handle only the lower portion of the carbide speed range. Since it is not considered good practice to run any machine tool at its highest speed for a long period of time, many "gun drilling" jobs which have been tooled with carbides have actually been operating at too low a cutting speed. Although a slightly longer drill life may have been obtained because carbides are more wear-resistant than high speed steel, the full advantage of carbides was not obtained because the cutting speeds were below the most economical range.

Fig. 10. Carbide drill to show the 100°-104° included angle for the flute. The ratio of the cross-sectional area of the oil hole "B" to the cross-sectional area of the drill flute "A" should not be less than 1 to 4.3, a ratio which has been determined by extensive tests.

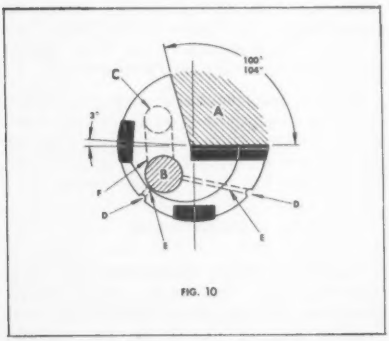


FIG. 10

Feeds

Practically all "gun drill" work to date has been done with feeds within the range of .0006" to .0036" per revolution, the lighter feeds for the smaller size drills and the heavier feeds for the larger sizes, since the latter have the greater rigidity.

The rate of feed, however, also depends on the oil pressures being used and the size of the oil hole through the drill. In other words, for all-depth drills to function properly at high feed rates, the rate of oil flow must be sufficient so that there is no tendency for the chips to pack in the drill flute. In this connection, it is advisable to use a 100° to 104° included angle for the flute, see Figure 10. Also, the ratio of the cross-sectional area of the oil hole "B" to the cross-sectional area of the drill flute "A" should not be less than 1 to 4.3, a ratio which has been determined by extensive tests.

It has been found that wear strips last longer if small oil grooves "D" are milled ahead of each wear strip, Figure 10. The rear end of each groove should be connected to the main oil hole "B" by a drilled hole "E". This permits a uniform distribution of oil in front of each wear strip. Frequently, an additional oil hole "C" is drilled through the steel body. In this case, oil holes "B" and "C" are connected to enlarged oil hole in the rear end of the drill end.

It has also been found that as the rate of feed is increased, there is an increased tendency for the drill to deviate from its true course.

Rotary All-Depth Drills

Frequently the question is asked if carbide tipped all-depth drills can be rotated instead of rotating the work, particularly where the work is not only irregular but is also too large and heavy to be rotated readily. The general indications are that long drills should not be rotated because the unsymmetrical shape and the relatively small cross-section tend to set up an unbalanced condition which may result in drill chatter and a rapid breakdown of the cutting edge. This becomes particularly

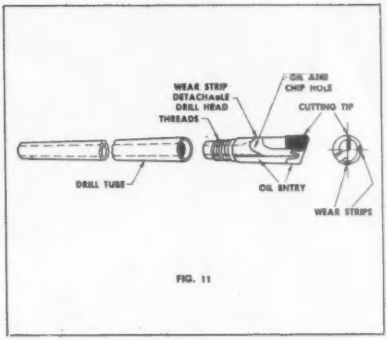


Fig. 11. Special design for a short drill which can be rotated instead of rotating the work. Cutting angles are comparable to those used in stationary drills: chips are carried out through center of drill instead of an external flute.

pronounced at the much higher RPM of carbide drills as compared with high speed steel drill practice. It may be feasible to rotate a short drill, however. In this case, an alternative design of drill shown in Figure 11 may also be used. The cutting angles may be comparable to those used in the stationary drills, while the chips would be carried out through the center of the drill instead of external flute. The cutting oil in this case flows to the cut through a longitudinal, flattened opening along the periphery of the drill, and returns through the center, carrying the chips.

General Conditions

Wherever a drill steady-rest has to be used, the smoothest operating conditions are always obtained if the drill steady-rest is located approximately midway between the drill feed slide and the combination drill guide and work support carriage.

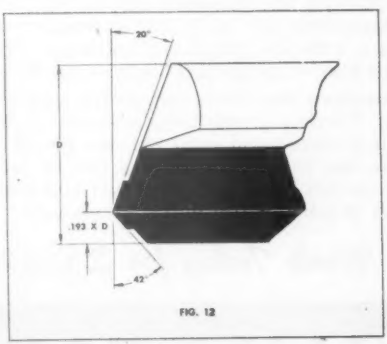
Occasionally a drill may "sing" as a result of high frequency vibration or chatter. Generally, "singing" can be eliminated by driving a triangular-shaped wooden wedge into the two guide bushings as previously shown in Figure 8. These wedges should be tightened from time to time.

Current indications are that when all-depth drills approach a diameter of 2½", it is necessary to break the broad chip which comes from both the 20° and the 42° cutting angles. Steps ground in the cutting edges, Figure 12, will do this effectively.

If the cylindrical land along the cutting edge shows signs of rapid wear, the excessive pressure can be relieved by increasing the distance from the periphery to the drill point by a slight amount. If the wear strip located at 183° behind the cutting edges shows excessive wear, a slight decrease in the distance from the periphery to the drill point will remedy the condition.

A slight change in the relationship between the 42° outer cutting angle and the 20° inner cutting angle will also change the amount of side pressure in either direction. A change in these angles may also be used as an aid in breaking up the chips flowing from the drill.

Fig. 12. When the all-depth drill approaches a diameter of 2½ inches, it is necessary to break the broad chip which comes from both the 20° and the 42° cutting angles. Steps ground in the cutting edges will do this effectively.



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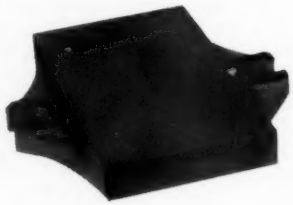

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Thermo Electric Temperature Changes

● *In the Thermo Electro Mfg. Co's. advertisement on page 24, the temperature at which their new TEMCO line of furnaces can be operated continuously should read 1650° F instead of 1750° F; intermittent operating temperature should read 1900° F instead of 2000° F.*

Newly Designed Broaching Machines

A line of horizontal and vertical broaching machines of entirely new design has been introduced by the Acme Broach Corporation, Milan, Michigan. The small Acme machine shown in Figure 1 is typical of the 36" stroke, horizontal machines built in two, four and six ton capacities. Larger Acme machines, as illustrated in Figure 2, are built with a 54" stroke in capacities of six, ten and fifteen tons, as well as 66" stroke machines in fifteen and twenty ton capacities. In addition to these, a series of 48" stroke machines are built in two, four and six ton capacities.

These machines are all of entirely new design and offer many valuable features, some of which are as follows:

1. Easy and convenient vertical adjustment of pull block.

2. The use of tubular-type steel cylinders honed to a mirror finish, assuring freedom from leaks.

3. Main pulling cylinder is in direct line with face plate bore of machine and assures straight line pull of the broaching tool, minimizing the possibility of broach breakage.

4. The drive motor and hydraulic pump are easily accessible and located in a ventilated compartment designed for this purpose. The hydraulic pump is not submerged in oil, thus eliminating the need for draining the oil to make repairs to the pump and eliminating the possibility of the pump heating the hydraulic oil.

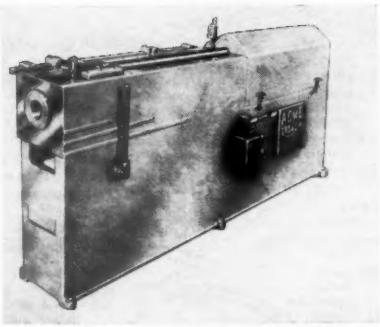


Fig. 1. Acme 36" stroke, horizontal broaching machine, hydraulically operated, built in 2, 4, and 6 ton capacities.

5. The sliding head is guided by hardened and ground ways which are located well above the center line of the broach, thereby eliminating the possibility of chips or iron dust falling upon the ways and causing excessive wear to them.

6. The machine is equipped with a high-speed individual return cylinder, which is also of the tubular-type steel.

7. Hydraulic circuit is equipped with speed control for adjustment of cutting speed as well as a relief valve for protection of the circuit.

8. Machines have been designed so

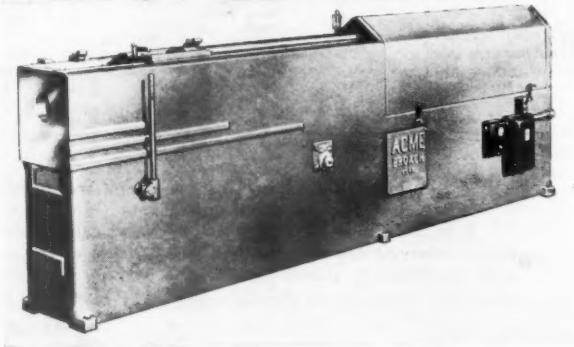


Fig. 2. Acme hydraulically operated broaching machine having 54" stroke, built in 6, 10, and 15 ton capacities. Also built with 66" stroke in 15 and 20 ton capacities.

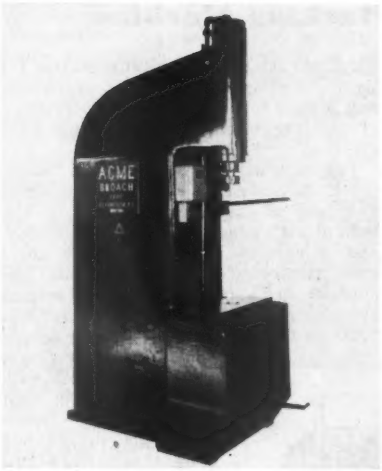


Fig. 3. Acme 6 ton vertical hydraulic press having a 24" stroke.

that all unnecessary projections and exterior piping have been eliminated, making it a relatively easy job to keep them clean and also lessening the possibility of foreign matter being put into filler spouts or other pipe connections.

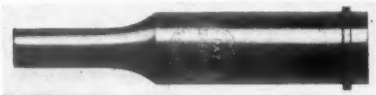
The Acme six ton vertical hydraulic press, having a 24" stroke, is shown in Figure 3. Vertical presses for broaching, pressing and straightening operations in two and four ton capacities, with strokes adjustable up to 24", are also manufactured. These machines are similar in appearance to the six ton press but have a somewhat smaller frame and an exposed drive motor. These presses feature convenient operating buttons, simple adjustment of stroke, adjustable position of operating lever and simplified hydraulic system. Drive motor and pump are mounted on a common base and can be removed from the machine for inspection or service by merely breaking the feed and return unions.

Vertical internal and surface broaching machines in limited range of strokes and capacities are also available.

Acme Broach Corp., Dept. 32, Milan, Mich., or circle our postage-free **Inform-A-Gram Key No. D91.**

"Ring" Punch

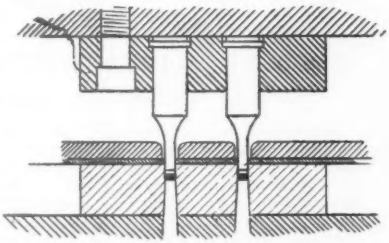
The latest development of the Ring Punch and Die Company, Jamestown, New York, is the Ring perforating punch which, after being fully tested in actual use over a period of years, is now available in a large range of standard and special sizes. The Ring punch is of rugged design and is accurately ground. The mounting of the punch is of extreme



simplicity, no special retainer being needed other than a counter-bored hole which accommodates the punch shank and spring washer retainer. Close grouping of the punches is limited only by the body diameters.

Standard Ring punches are made from Carbon-Vanadium, water hardening tool steel of specifications which have proved to be the best for general use.

Special Ring punches are of High Carbon, High Chrome tool steel, for use on such stock as Monel and stainless



steels and for extremely long production runs on tough materials.

All Ring punches are subject to a rigid inspection that insures precision work, concentricity and proper hardness. All standard sizes are available for immediate delivery.

Literature giving detailed specifications may be had from the distributor, American Sales Co., 13413 Euclid Ave., Cleveland 50, Ohio, or by use of our postage-free **Inform-A-Gram Key No. D89.**

The "Automark" Marking Machine

Designed for rapidly marking light and medium work, particularly on flat surfaces, the Cadillac Stamp Company, Detroit, has introduced the "Automark" marking machine. Round stock and parts can be marked lengthwise, parallel to the axis or by use of curved dies if the radius is not too short.

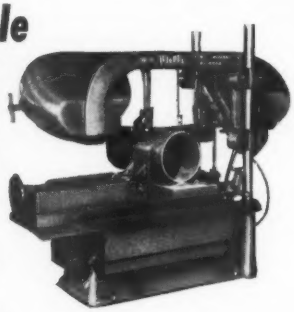
In addition to effectively marking steel, iron, brass, aluminum, Bakelite, plastics, leather and wood, it is adaptable to brand-burning applications and gold and color-leaf marking on wood, plastics, Bakelite, and leather, on a production basis. It is ideally suited for light forming and piercing operations and is used for assembly work consisting of pressing, staking, crimping and light riveting.

Precision built throughout, the "Automark" consists of a cylinder head, cover and base of meehanite castings, a column of high grade seamless steel tubing, and a cabinet of heavy gauge sheet steel, reinforced and soundproofed. The cylinder head, cover and base castings are precision machined to a mirror-like finish to assure a perfect fit when assembled. All parts are fully machined with the same care that goes into the power head, piston, valves and other operating parts. Valve parts are specially hardened for long life.

The "Automark" operates pneumatically on standard air pressures maintained in all plants. The heart of this machine is the power head and the double-acting valve that reverses the ram on impact. At the moment of impact, the valve reverses itself, opening escape ports and forcing the ram back up under pressure. A special spring holds the ram in the raised position when the machine is not operating. The machine will develop 3000 pounds pressure at a 90-pound air line pressure and 7000 pounds at a 150-pound air line pressure.

The installation and operation of the "Automark" is quite simple. Connection is made to any available air line.

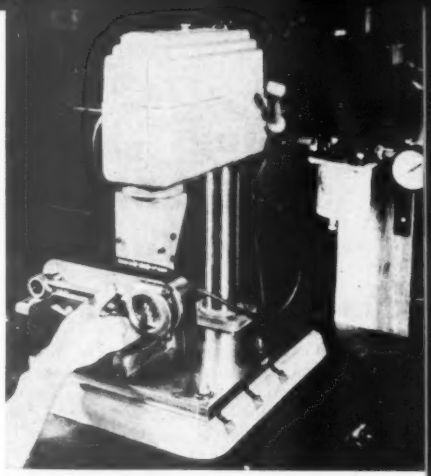
Now Available
with wet cutting system . . . the
WELLS No. 12
METAL CUTTING BAND SAW
Featuring
AUTOMATIC CUTTING CYCLE and CONTROLLED BLADE PRESSURE



The heavy duty, hydraulically operated Wells No. 12 Metal Cutting Band Saw, with automatic cutting cycle and special blade pressure controls, is now available with a NEW time and money saving extra—the Wells wet cutting system. This complete self-contained system permits safe use of higher f.p.m. cutting speeds and increases blade efficiency. Installed as an integral part of the saw, the system includes chip pan, fluid tank, centrifugal type pump unit, screened intake splash guards, and flow control valve. Ask your Wells Saw Dealer for full information or write direct to the factory.

Wells Saws
Wells
Products by Wells are Practical
METAL CUTTING BAND SAWS
WELLS MANUFACTURING CORPORATION
1940 CEDAR ST., THREE RIVERS, MICHIGAN

PLEASE USE INFORM-A-GRAM FOR PRODUCT INFORMATION



The air filter, furnished with the machine, is connected just ahead of a diaphragm-type regulator and pressure gauge, with flexible hose running to the machine. This snaps on the fitting in the side of the cylinder head and the machine is ready to operate. The automatic control is a simple tripping device which requires but a slight tough of the finger, or the part to be marked, to automatically open an air chamber valve and a double-acting valve permitting controlled air pressure to drive the piston head down in a sudden hammer-like blow. The piston head instantly returns to its raised position in readiness for the next marking. This operation takes but a split second and the speed of the machine is limited only by the operator's speed.

Tests show as many as 4,000 parts have been automatically stamped per hour in the production operations of one plant, saving two whole working days as compared to previous marking methods.

The automatic control is usually placed on the T-slot table just back of the piston head so that parts to be marked may be placed against the trip in such a position as to receive the marking in the desired location. This control is easily shifted to any position on the T-slot table, so that parts of various dimensions and shapes can be handled.

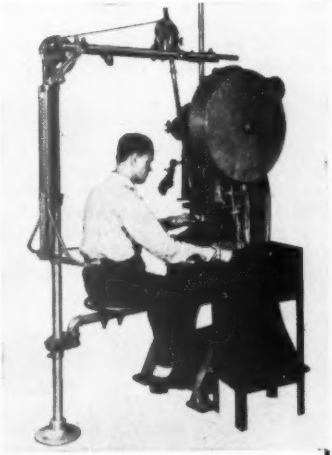
Complete specifications on this machine are available from the Cadillac Stamp Company, Dept. 54, 2136-2138 Riopelle St., Detroit 7, Mich., or circle our postage-free **Inform-A-Gram Key No. D82.**

You can make your punch presses

positively safe

with **POSSONS**

POSITIVE SAFETY DEVICES



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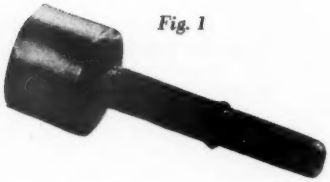


Fig. 1

Industry now faces doubling labor costs, increasing material costs and rising general overhead costs. The problem is where to turn to make an honest dollar. To increase selling prices is to ask for increased buyer resistance.

There are several alternatives: sell more units; modernize methods and equipment; add new products with better margins; or design products so they cost less to make.

Smart thinking adds up to more economical, faster, automatic methods of doing things. There is tough competition ahead for those who decide to let things slide along as they are.

The New Britain-Gridley Machine Division of The New Britain Machine Company has made a survey of New Britain-Gridley automatic machine users, to uncover cost histories where modernized methods and automatic equipment have been installed. Ten of these cost histories have been prepared and are available in folder form. Others are being added periodically.

Distributor Base

Several of these cost histories are here described. The cast iron distributor base, illustrated in Figure 1, was formerly machined on a battery of lathes by a leading manufacturer of automotive parts. New Britain Machine Co. engineers were able to set the job up on one New Britain multiple-spindle chucking machine which increased the production rate six times; from 31 to 186 pieces per hour.

Concentricity of the hole between the bowl and the shank ends is limited to .005". This was easily maintained despite the length of the shaft (9$\frac{5}{8}$") by the use of hydraulically operated hook bolt fixtures shown in Figure 2, and a drill guide in the 6th position, Figure 3.

This job was performed on a New Britain Model 675 six-spindle automatic chucking machine.

The following cycle was set up as the most economical:

1st Position —Load
2nd Position—Rough turn OD of shaft half way. Chamfer end of shaft. Drill part way.
3rd Position —Rough turn remainder of shaft OD. Face end of shaft. Drill to shoulder (drill speeder).
4th Position —Cross face shoulder and cut relief. Finish face end of shaft.
5th Position —Bore for bushing (drill speeder).
6th Position —Finish turn. Ream out bore.
Production —19.4 seconds per piece. 180 pcs. per hour.

It should be noted that in the second, third and sixth positions, external and

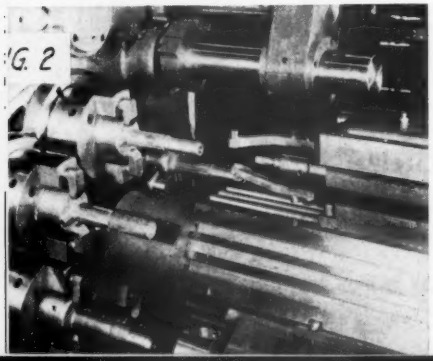


FIG. 2

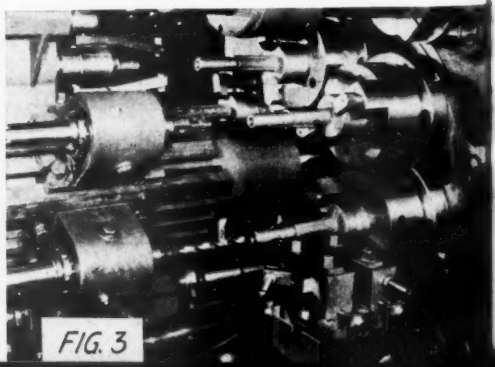
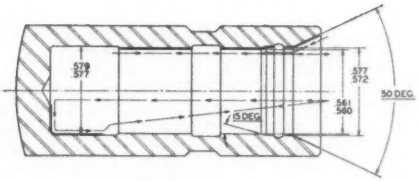
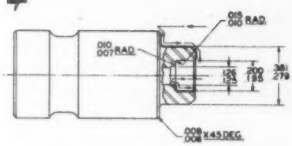


FIG. 3

FIG. 4



Lash Adjustor Body



Plunger

internal operations are performed on the workpiece.

Adjustor Body and Plunger

Generating contours instead of plunge cutting enables one of the large manufacturers of automotive parts to handle multiple operations with more dependable accuracy, better finish and greater efficiency. A New Britain contour boring and turning machine kept down the original investment and the operating cost per piece in the manufacture of the valve assembly parts schematically illustrated in Figure 4.

A New Britain Model 36 contour boring and turning machine illustrated in Figure 5 was used on this job.

The material of the lash adjustor body is induction hardened cast iron and that of the plunger is steel.

The adjustor body, Figure 4, is gripped in a double diaphragm chuck, using split sleeves, on the .7182 diameter and the inside contoured as follows:

Two single-point tools set in separate tool holders mounted on the contour table perform the operations on the adjustor body. The first tool bores the 50° angle, the .572-.577 dia. and the 15° angle at .004 ft. per rev., then bores the .561-.560 dia. in and out. The slide indexes and the second tool faces the bottom, generates the radius, and bores the .577-.579 dia. for a distance of .354".

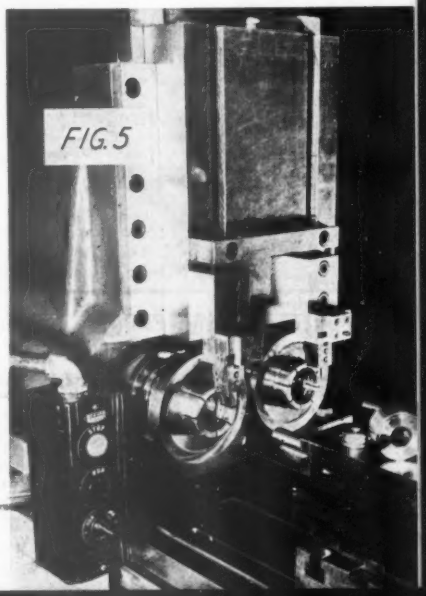
The gross production is 229 pieces per hour.

Carbide boring bars with $\frac{3}{4}$ dia. solid carbide bits are used. A cutting speed of 308 fpm was found to result in the greatest tool life and production, with tool life in excess of 800 pieces per tool grind. Tools are set in spare bars to a comparator chart and bars may be changed in holders in less than five minutes. The average depth of cut is .008.

Twelve machining operations are performed on the plunger, Figure 4, by two single-point tools. The first tool chamfers the OD, faces the shoulder, turns the stem and chamfers and faces the end. The slide then indexes and the second tool chamfers and bores the .195-.200 dia., plunges the .010-.015 radius, faces, generates the critical .007-.010 radius, and bores the .125-.126 dia. The gross production on this cycle of operations is 393 pieces per hour.

The contour boring and turning machine setup shown in Figure 5 is not for the machining operation just described, but is used for machining reverse planet pinions. The vertical slide presents two facing tools to the piece while the boring tool is in operation. On many jobs such an arrangement can reduce cycle time as much as 50%.

Complete information on these New Britain machines is available from The New Britain-Gridley Div. of The New Britain Co., Dept. 20, New Britain, Conn., or circle **Inform-A-Gram Key No. D83.**



Two New Air Tools

There have been two interesting additions to Aro Equipment Company's famous line of air tools for industry. One of these is a tool mounting fixture shown in the top photograph at left. This ruggedly built fixture is suited to the many screw driving and nut setting jobs where it is more practical to bring the work to the tool. Assemblies can be handled so much easier and quicker with the tool mounted in this fixture because, of course, the operator has the use of both hands. Thus, production can be increased 40% to 60%. The fixture will accommodate Aro air tools from the small size drills, grinders and screw drivers to the large ½" drill, and is ideally suited for all electrical tools. The clamp for holding tools is designed to accommodate various diameters, and is easily adjusted.

Shown in the bottom photograph is Aro's new air-powered reversible screw driver and nut setter. Ample power and high driving torque make it ideal for driving Nos. 1 to 10 machine and wood screws and ¼" nuts. The low free speed of 1,000 r.p.m. (working speed of 750 r.p.m.) insures perfect contact with the screw slot, and prevents marring of screw heads. This slow speed also makes screw driver bits last longer and cuts wear and breakage to a minimum. The reverse speed and power are identical to the forward driving conditions. The mechanism is conveniently located on the rear of the motor housing, and by merely turning the button to the left the machine reverses — to the right or forward. Write to Aro Equipment Corp., Dept. 195, 1941 Erie Ave., Bryan, Ohio. **Inform-A-Gram Key No. D71.**

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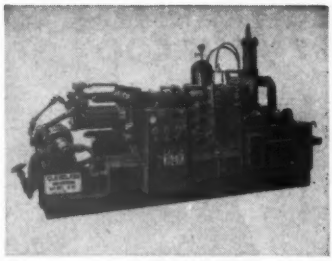
Die-Casting Machine: A New Cleveland Model



Designed to produce a wide variety of high quality castings on a profitable production basis, the Cleveland Automatic Machine Company has recently announced the new Model 200 die-casting machine.

The machine is the result of intensive research and development. It has platens approximately 27" x 27" and is capable of high speed, round-the-clock production.

The machine is built of welded, flame-cut steel plate, assuring a construction capable of withstanding any shock or strain involved in die casting. This results in a machine that will lock dies with tremendous pressure and make castings with a minimum flash.

Some of the outstanding design and construction features of this machine are: manual or full automatic control; easy accessibility; fast injection feed; mechanical or hydraulic ejection; platen supported by bronze wedges; die stroke adjustable by hand crank; die movement controlled by safety valve; heat exchanger and oil filters; hardened toggle pins and bushings; seamless steel tubing hydraulic system; swivel fittings on die and shot ends; nitrided gooseneck sleeve; ease of changing machine from cold chamber type to gooseneck type of machine and vice versa.

A bulletin giving specifications for this machine is available by writing The Cleveland Automatic Machine Company, Dept. 238, 4932 Beech St., Cincinnati 12, Ohio, or circle **Inform-A-Gram Key No. D81.**

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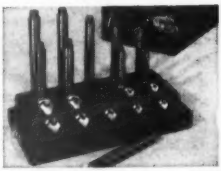

TO FIT ¾" CHUCK, set J-812 has similar Bokum Cutter Heads from No. 4 to 8 with standard and extra long shanks.

Hole diameter range: 1⅛" to 3½"
Maximum depth range: 6¾"

Both sets contain a ¾" adaptor for use of smaller tools (as shown in box at left). Thus bringing boring range of diameters down to ⅛" holes.

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Spring Clutch Drive Tapping Head

A new tapping head designed to fit any drill press has been recently announced by The Commander Mfg. Co. This tapper can replace three conventional tappers because it will handle taps from #0 to ¾", a range usually requiring three or more tapping heads.

The Commander Tapper employs a patented spring clutch drive and an adjustable torque control, features which bring to machine tapping an extreme sensitivity and wide range of adaptability. These features are the basis for

the claim that one Commander Tapper can replace three, with consequent reduction in tool investment. The tapper is ideally suited for cycle tapping and OD threading, as well as routine machine tapping. Accurate blind hole tapping is accomplished with ease and without damage to taps and equipment because of the multi-torque control.

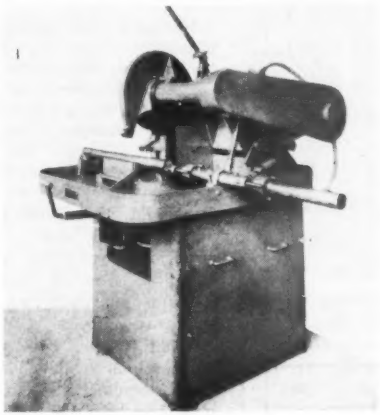
The spring clutch drive eliminates the slippage and wear caused by misadjustment and misuse common in conventional type tappers. In addition, it is impervious to oil, grease, moisture, and weather.

Torque of the Commander Tapper is quickly and easily set to any size tap from #0 to ¾", either on or off the drill press, by merely pushing a button and turning the scale to the desired position for the tap to be used.

Request complete details from The Commander Mfg. Co., Dept. TD, 4225 W. Kinzie St., Chicago, Ill., or circle Inform-A-Gram Key No. D4.

New Metal Cutting Machine

A new cut-off machine, designed primarily for the metal-working industry and especially applicable to machine shops where brass, bronze, and steel bar stock, tubing, angles and flats require cutting, is now being manufactured by The Tabor Manufacturing Company. The machine will also cut plastics. A cost-reducing feature of the machine is the fan-cooled 10 hp motor which provides adequate power to maintain the proper wheel speed in cutting any quantity of metal or plastic. Several features of the machine boost the over-all speed of production, one of which is the quick-acting clamp. A hand wheel quickly adjusts the start of tension on



any stock; a downward thrust of a lever applies the tension. Two clamps hold the work so securely in V-blocks that end support of uncut stock is unnecessary. Another feature is the over-all cooling action caused by the coolant being thrown centrifugally at the cut from both sides of the wheel. Both the spindle and trunnion are roller-bearing mounted and automatically lubricated—another time-reducing feature. For further details write The Tabor Mfg. Co., Dept. 95, 6225 Tacony St., Philadelphia 35, Pa., or circle **Inform-A-Gram Key No. D30.**

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Niles Engineering Stepped Up

Because of the magnitude of engineering research involved in present and future activities, the Niles-Bement-Pond Company, West Hartford, Conn., is rearranging and broadening its engineering facilities to keep pace. Niles includes two divisions in West Hartford: Pratt & Whitney and Chandler-Evans, plus a wholly-owned subsidiary, Potter & Johnston Company, Pawtucket, R. I.

As the first move in establishing the broader engineering coverage, Fred U. Conard, Niles president, announced that Paul Mueller, formerly Pratt & Whitney machine tool engineering head, has been relieved of those duties so as to devote full time to engineering research. He will be associated with Milton Chandler, well known engineering head of the Chandler-Evans Division. A. Price Drummond has been appointed manager of Engineering in the Machine Tool Division. He will be responsible for the administration and technical development of the Machine Tool Engineering program.

★ ★ ★

American Roller Die Acquires New Line

Harry J. Eisenman, president of the American Roller Die Corp., Cleveland, Ohio, has recently announced that his company has acquired patents and sales rights formerly held by the McKinney Tool and Manufacturing Co. This new acquisition includes a complete line of roll forming machines, automatic cutoffs and various other patent applications relative to the fabricating field. American Roller Die Corporation is well known as a manufacturer of forming rolls and special machinery and have complete facilities to produce the entire McKinney line. This will be done under the former McKinney Tool & Manufacturing Company's name bearing the American Die Corp. "Ardcor" trade name.

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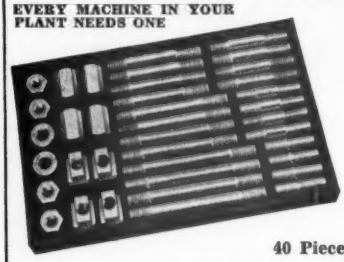

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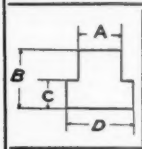

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★ ★ ★

Tool Company Changes Name

The former Metal Cutting Tools and Manufacturing Company, Berkley, Michigan, is now operating under the new company name of Fuller Tool Company. The change in name was decided upon with the completion of an extensive modernization program of the company's new plant that has greatly increased manufacturing facilities. Beginning business several years ago as manufacturers of small reamers, the organization has enjoyed a steady growth each year since, and, in addition to reamers, has attained country-wide recognition as producers of fine precision tools for a wide diversity of special purposes. There is no change in company policy or in personnel—the only change is in the name.

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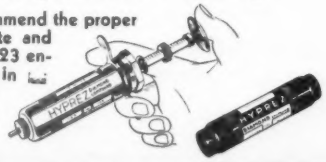

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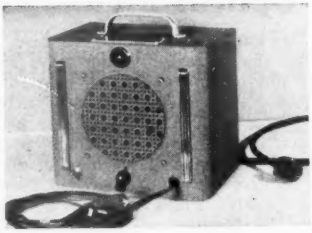

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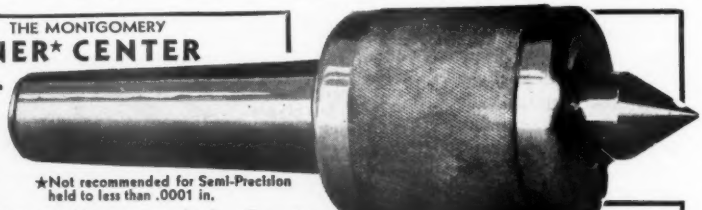

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Bright-Annealed Cold-Rolled 18-8 Available

By means of a new process pioneered by The Cold Metal Products Company, Youngstown, Ohio, chrome-nickel steels such as the popular 18-8 in dead-soft annealed temper can now be furnished for the first time in a bright, mirror-like finish without expensive buffing or polishing. The extraordinarily bright finish is achieved by rolling with special tungsten carbide rolls and is retained during the annealed operation by a new technique. The elimination of costly polishing and buffing operations will be welcome news to manufacturers who would prefer the superior corrosion resistance of 18-8 but have been using straight chromium grades to escape the high finishing cost after annealing. Increased profit for the manufacturer, and a better product are the obvious outcomes of this new process. The Cold Metal Products Company is offering this new product in widths up to 7½" and in thicknesses .001" and heavier. It also can be furnished in coils weighing up to 300 pounds per inch of width, and fractional-inch sizes can be bobbin-wound.

★ ★ ★

New West Coast Representation for Lester-Phoenix, Inc.

Because of the phenomenal growth of the plastics industry on the West Coast, Lester-Phoenix, Inc., of Cleveland has established new representation in the Los Angeles area and has instituted a new installation program there. Seaboard Machinery Company, 3212 East Olympic Blvd., Los Angeles, is the representative. Seaboard Machinery is a partnership consisting of William J. Hennessy, Jack W. Ditewig and Richard H. Priest. The new installation program provides that every machine sold through Seaboard Machinery Company will be set up and demonstrated by a factory engineer from Lester-Phoenix's Cleveland plant.

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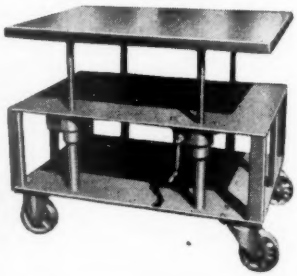
make LIGHT work of HEAVY dies

With the BARRETT LIFTING TABLE—you can do it economically, too! It lifts and lowers heavy dies by simple crank operation—provides easy conveying on smooth-rolling, heavy-duty casters. Barrett Lifting Table cuts costs, cuts time, safeguards men and dies. It's invaluable in carrying dies to and from machines... in supporting long bars, sheets, frames, etc.

Available in 2 capacities, 2000 and 3000 lbs. *Write for full details.*



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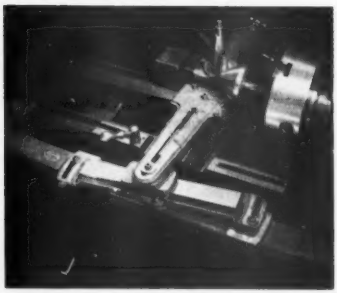
Barrett Handling Equipment

BARRETT

ONE MAN DOES MORE THAN 3 OR 4... WITH A BARRETT

Save $$$ New TAPER ATTACHMENTS

Nationally Advertised—Guaranteed



Save $10.50 to $15.50 on each attachment

Manufacturers List Prices
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SALES PRICE
$39. each
F.O.B. Chicago

● CAPACITY: Tapers up to 3½" per foot, 16½° maximum in either direction, 7½" in length at one setting.

● EASY TO ATTACH: Graduations in inches on one end and in degrees on the other end of the swivel bar. The sliding fixture has straight gibs eliminating vibration and allowing adjustment for constant wear. Sturdy, precision built.

TO FIT THE FOLLOWING LATHES:
LOGAN • POWR-KRAFT • ATLAS • CRAFTSMAN 9" & 10" SOUTH BEND • SHELDON • CLAUSING

Complete Instruction and Catalogues Furnished

Also Available
Heavy Duty, Wt. 65 lbs., for large Lathes, Sales Price $119.

MAIL ORDER NOW
Send Money Order or 20% deposit on C.O.D. shipments. Weight: 25 lbs. via Parcel Post or Railway Express.

DAVIS MACHINERY CO. 126 N. Clinton St. Chicago 6, Ill.
Rated in Dun & Bradstreet

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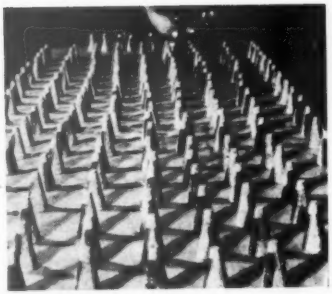
Grinding Wheel Production Speeded Up



Plans are now under way for the United States Rubber Company to triple its production of high-speed grinding wheels used by steel mills, foundries and metal fabricating plants. The increased production facilities will be established in a new plant in Fort Wayne, Indiana, where the volume and variety of both rubber and synthetic resin bonded wheels will be multiplied. The cone-shaped Royalite wheels, shown in the photograph at right, are being labeled in United States Rubber Company's new plant. Available now is a new catalog listing U. S. Royalite, Vulcanite and Corvite grinding and polishing wheels. U. S. Rubber Co., Dept. 62, 1230 Sixth Ave., New York, N. Y., or circle **Inform-A-Gram Key No. D85.**

* * *

Rite-O Tool & Gage In New Building

Rite-O Tool and Gage Company have announced their recent move to a new building at 321 West Ten Mile Road in Hazel Park, Michigan. Increased demand for Riteloy tools necessitated an expansion program, so in line with their usual progressive policy, Rite-O built a new plant and added to their manufacturing facilities.

New Plant for Arthur A. Crafts Co.

Arthur A. Crafts Co., Inc., announced recently that they had moved their Chicago plant and office from West Washington Blvd. to 4447 West Armitage Ave., Chicago 39, Ill., where they are now in full production.

Replacing five lathes with five 20" Power Feed Drill Presses, the Kingston-Conley Electric Co., North Plainfield, N. J. now turns three shaft diameters in a single operation. Results: *production tripled, man-hour costs halved.*

Broad adaptability of Walker-Turner's 15" Drill Press also enables the Kingston-Conley plant to design other set-ups for varied operations. Results are equally outstanding.

For Machine Tools that trim the cost of every operation, investigate the Walker-Turner line. *For complete catalog, write to Walker-Turner Division, Kearney & Trecker Corp., Plainfield, New Jersey.*

Motor shafts being fed into box tool containing three separate bits. 20" Power Feed Drill Head Model D-1101X with 6" spindle travel, 5 spindle speeds, 400 to 2600 r.p.m. Price: less motor and column $216.00.

FOR EXAMPLE

KINGSTON-CONLEY ELECTRIC CO.

TRIPLES PRODUCTION BY TURNING MOTOR SHAFTS

WITH WALKER-TURNER 20" POWER FEED DRILL HEADS

walker-Turner MACHINE TOOLS

DRILL PRESSES - HAND AND POWER FEED
RADIAL DRILLS - RADIAL SAWS
BAND SAWS - FOR WOOD OR METAL
RADIAL METAL CUT-OFF MACHINES - MOTORS

3465

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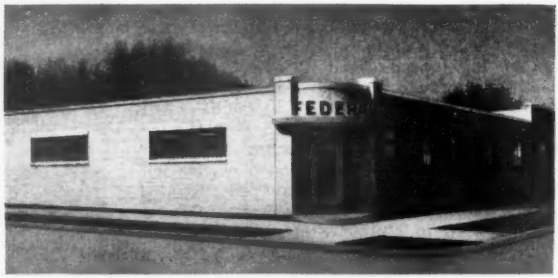
Now You Can Get Short Run STAMPINGS

Faster, and at Low Cost



Quality short run stampings are made faster in the new, larger Federal Tool and Mfg. Co. plant.

With the completion of moving into our new, larger plant, you are now assured faster deliveries of your short run stampings. In this new, modern plant, you will find production equipment and improved facilities, which, combined with a new short run stamping technique, assure greater output of highest quality stampings at lower costs.

Whenever you need short run stampings in a hurry . . . you can depend on FEDERAL.

Send your prints today for prompt, low-cost quotations.

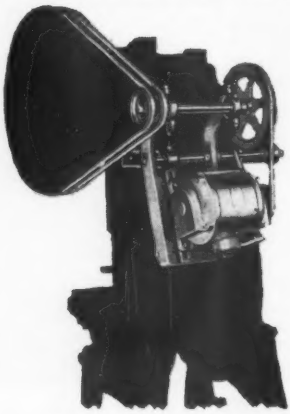
Write for FREE bulletin.

FEDERAL TOOL and MFG. CO.

"Quality Stampings in Small Quantities"

3614 Alabama Ave., St. Louis Park, Minneapolis 16, Minn.

MODERN MOTOR DRIVE



Puts the "PUNCH" in Punch Presses

"V" Belt Drives deliver the full horsepower from the motor to the flywheel — smoothly — silently — efficiently — economically.

Utilize standard 1750 RPM motors. Immediate deliveries

We invite your communications

• • •

MODERN MOTOR DRIVES DIVISION of

The Nichols Engineering Co. 2400 W. Madison St., Chicago 12, Ill.

Precision Honing of Cylinders and Pistons

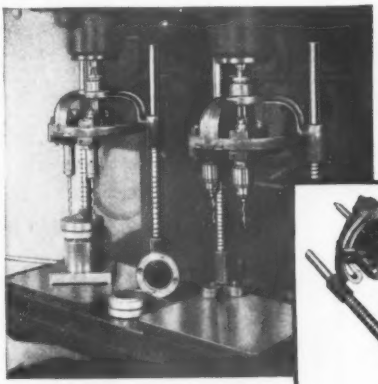
To demonstrate the progress that has been made in the honing field during the past few years the Sunnen Products Co. developed a workpiece called the "Sunnen Spinner". The Spinner (shown in illustration) consists of a ½" dia. hardened dowel pin (piston) and a barrel (cylinder) made of SAE 1112C.R. steel. The barrel of this spinner was rough and finish-honed on two Sunnen-Precision Honing Machines.

A running clearance of about 160 millionths of an inch was maintained—or an average side running clearance of one twenty-fifth the thickness of a human hair. This fit between the pin and barrel is practically air-tight, yet the cylindrical bearing surfaces are so true that the barrel will spin freely for several minutes on an air cushion created when the barrel is sealed with a stopper. However, the running clearance is so minute that a speck of dust or lint —or even the smallest oil film—creates a friction drag.

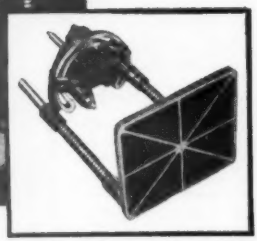
Rough honing was done at the rate of 40 parts per hour, with a stock removal from .003" to .004" from a reamed hole. Tolerance was held to .0001" on the diameter and .00035" for straightness.

The finish honing rate was 33 pieces per hour, with a stock removal from .0003" to .0004". The finish-honing tolerance was .00002" on the diameter.

For complete information on this honing process write Sunnen Products Co., Dept. 583, 7947 Manchester Ave., St. Louis, Mo., or circle **Inform-A-Gram Key No. D87.**



Overarm Type has heavy guide pins, ground base 12 by 14 inches.



LINDERME 2-Spindle Head

"increased production from 160 to 600 an hour"

This story is typical of the many applications of Linderme 2-spindle drill heads on long and short runs. You'll like these features: drills, taps —in metal, wood, plastics; quick, accurate adjustment, ½" to 6" centers; two minute set-up on most drill presses in your shop; anti-friction bearings, rugged gearing, quality machining—and Linderme's low initial cost for Overarm or Sleeve Types —Twelve models, capacities up to ½", available with G.M. Sleeves or Morse Tapers. Write for complete catalog.

LINDERME MACHINE AND TOOL CO., INC.

12250 COYLE AVE. • DETROIT 27, MICH.

Quick Acting JOHNSON FURNACES

1500°F. in 5 Minutes
2300°F. in 30 Minutes

Treat high speed steels, harden high carbon steels, braze carbide tipped tools in your own plant.

JOHNSON Hi-Speed No. 120

A fast, versatile unit for toolroom and shop. Hardens ANY steels, tools, dies or small metal parts. Compact, powerful and remarkably economical in operation. Saves time and gas. Easily regulated. Firebox 5 x 7¾ x 13½. Complete with Carbofrax Hearth, G. E. Motor and Johnson Blower.

$145.50
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ORDER TODAY!

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UNIVERSAL DRILL BUSHINGS

Universal Drill Bushings with superhoned bores have been the first choice of industry since the founder of Universal Engineering Co. originated standard drill bushings nearly 30 years ago. Available in standard and special sizes to speed and simplify your jig drilling at greatly reduced tool breakage costs. Complete stock of standard bushings available for immediate shipment. Write today for complete information.

UNIVERSAL ENGINEERING CO.
FRANKENMUTH 8, MICHIGAN

PLEASE USE INFORM-A-GRAM FOR PRODUCT INFORMATION

New Drill Grinders

New twist drill grinding machines for sharpening drills from No. 52 to 4" have been introduced recently by the Gallmeyer and Livingston Company of Grand Rapids, Michigan. The new CWA Double Holder Machine (illustrated at left) is designed to sharpen 2, 3, and 4-flute drills of either straight shank or taper shank type at the standard 59° angle. The only adjustment necessary when changing from the sharpening of a small 2-flute drill to the grinding of a 3-flute drill of a larger diameter is to slide the tailstock so that it compensates for the difference in length. The small drills are ground dry on one side of the machine, and large drills wet on the opposite side. Thus the double holder construction makes it possible to provide for maximum convenience in the handling of the small drills together with the necessary capacity for the large ones.

The grinder is built around a heavy, rugged, one-piece column designed to provide maximum rigidity to the machine. It has an accurately machined spindle running in double row precision ball bearings. The bearings are grease-packed and have built-in shields for retaining lubrication and excluding grit and dirt. No further lubrication or attention is needed. For further details write to Gallmeyer & Livingston Co., Dept. 625, 304 Straight Ave., S.W., Grand Rapids 4, Mich., or circle our postage-free Inform-A-Gram Key No. D88.

SURFACE PLATE EQUIPMENT —

Fine-grained, special analysis semi-steel castings, precision ground to the required accuracy, specially heat-treated are used in the making of these shop-tested aids to production.

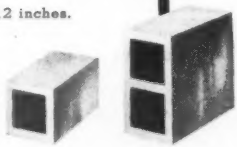
UNIVERSAL IRONS—4 Sizes
From 4x5x3¾ inches to 8x10x5½ inches.

ANGLE PLATES—22 Sizes
From 3½x4x4 inches to 24x24x24 inches.

V-BLOCKS—7 Sizes
From 2x2½x5 inches to 12x12x12 inches.

BOX PARALLELS—
18 Sizes to 12x12x24 inches.

SOLID PARALLELS—
18 Sizes to 1¼x2x12 inches.



BUY AND KEEP
VICTORY BONDS

Challenge

535

THE CHALLENGE MACHINERY CO.
GRAND HAVEN, MICHIGAN

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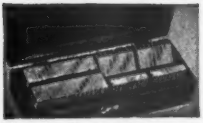
SCHERR *aids to precision – production*



Save time on Surface Grinders With Scherr MAGNE-BLOX

When placed on a magnetic chuck, these magnetism-conducting parallels and angle irons will firmly hold small pieces and irregular shaped work. No need of special clamps or fixtures. THEY RETURN THEIR COST many times over by quicker setups, more accurate results, less danger of distortion and bowing when grinding thin flat work. Many different sizes and shapes. DON'T REGRIND YOUR MAGNETIC CHUCKS—BE WISE—USE MAGNE-BLOX—**Special Offer:** Set consisting of 2 parallels 1 x 1⅝ x 3⅝ plus 2 V-blocks, hard brass and Swedish iron laminations in solid metal case, $17.50. Money back if you can duplicate this value.

Scherr Cutting Tool Grinding Fixture

FOR SURFACE GRINDER, grinds both cutting angle and clearance in one setting. The unique patented feature is a tilting block which gives 3, 5, 7, or 10 degrees clearance to the tool, just the right cutting angle to suit the material to be machined. This simple inexpensive tool does the work of special machines. Clamp the tool to be ground in the Scherr Fixture, set to angle desired and tilt the block to proper clearance. Special introductory price, $27.50. F.O.B. New York, with Scherr money back guarantee.

Little Wonder Radius Dresser

Dresses wheels on surface or cylindrical grinders to any desired radius up to 1", concave or convex. The swinging arm, the only moving part of this ingenious simple device, is pivoted on two lapped centers which never freeze or clog. Supported on both ends with no overhang or slides, there can be **no vibration of the diamond.** Result: absolutely smooth and accurate radii on the wheel. The diamond tool is set by means of micrometers, depth gage or gage blocks. Price complete with ½ carat diamond, $46.00—$39.00 without.

Measure Gear Pitch Quickly—

Scherr Gear Gage Set

Used like a thread gage, complete set measures any pitch from 3 to 64. Something the gear-using world has long needed. Set, $12.50. Specify 14½ or 20 deg. P.A.

GEO. SCHERR CO., Inc.
197-A Lafayette St. New York 12, N.Y.

New Service to Machinery Builders

An intensive program for developing new uses for aluminum in industrial machinery is under way by Reynolds Metals Company of Louisville, Kentucky. There is already a great interest in aluminum in this field, and Reynolds Metals are ready to answer all inquiries. In the last year a tremendous volume of extruded aluminum shapes have gone into textile machinery where it has been exceptionally advantageous because its light weight means moving parts can have less inertia thus permitting greater operating speeds and smoother action with less vibration. Almost any cross section is possible with the extrusion process so that it is possible to make a single aluminum extrusion that can replace two or more cast iron or steel parts that require machining of adjoining surfaces and subsequent assembly. The high humidity encountered in textile mills has no effect on aluminum—which retains its original shape with no warping or distortion. Reynolds Metals Co., Dept. 64, 2563 So. Third St., Louisville, Ky. **Inform-A-Gram Key No. D55.**

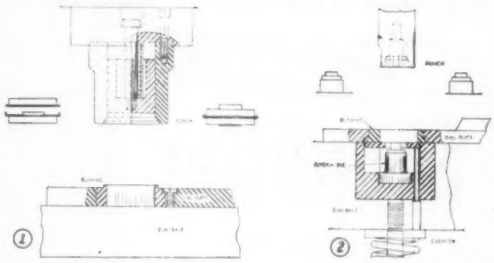
Kearney & Trecker Buys Walker-Turner

Kearney & Trecker Corp. of Milwaukee, one of the world's largest builders of machine tools for milling and boring, has recently announced its purchase of the Walker-Turner Company, Inc., Plainfield, N. J. Walker-Turner manufactures a line of light machine tools for industrial and home workshop uses. Francis J. Trecker, president of Kearney & Trecker Corp., in making the announcement, said that Walker-Turner will continue its operations in the New Jersey plant as the Walker-Turner division of Kearney & Trecker. General supervision and present management will remain the same. Walker-Turner's line began in 1922 with light woodworking tools for the home and small shop, but since 1937 they have concentrated on light machine tools of high quality and precision for industrial application.

PLEASE USE INFORM-A-GRAM FOR PRODUCT INFORMATION

Operation of Dial Feed Presses

An oustanding development in the past few years has been the dial feed press manufactured by the Federal Press Company of Elkhart, Indiana. This Federal unit enables an operator to handle four to six times as much work of certain types as he otherwise could produce on a conventional press. Secondary operations such as redrawing, piercing, stamping, broaching, wiring, punching and burring on blanks or shells can also be performed on these Federal Dial Feeds. In addition, the presses may be used for many assembling, riveting and closing operations on finished parts and on material other than metal. Several operations may be performed in sequence, in which case it is advisable to balance the operations so that the strain on the slides will not be excessively off center and to provide separate adjustment for height on the punches.



In a typical Federal Dial installation, the operator places shells in the bushings or on posts at the front of the dial. They are then carried around into accurate alignment with the punch and then carried further on and either mechanically ejected, picked off or dropped through the base. With these feeds an unskilled operator can catch every stroke of a press operating continuously at full rated speed (60 strokes per minute).

Federal Press Co., Dept. 289, 1607 Division St., Elkhart, Ind., or circle **Inform-A-Gram Key No. D86.**

"We've Found **PROCUNIER**
Tapping Heads
PERFORM BEST!"*

● That's what they all say . . . men who have used Procunier Tapping Heads in the shop for years. Consistent, accurate tapping and faster tapping with a minimum of tap breakage . . . as reported by actual users over the years . . . has made "Procunier" the standard of the industry. The sensitive, double-cone friction clutch, which engages the surfaces of the drive and reverse shells with a soft, "cushioned" action . . . the heat-treated reversing mechanism . . . the ball bearings for accuracy . . . the single-hole lubrication, have made Procunier noted for consistently better performance. See how these Procunier Heads . . . proven on all kinds of jobs for over 30 years . . . can save you time and money. *Name on request.

PROCUNIER
Safety Chuck Company
12-14 S. Clinton St., Chicago 6, Ill.

"True-Grip" Tap Holder—Lighter, smaller in diameter, it affords easier tapping close to walls or shoulders, eliminates "chewed up" tap shanks.

SEND FOR CIRCULAR

Procunier Safety Chuck Co.
12-14 S. Clinton St.
Chicago 6, Ill.
Gentlemen:
Please send your illustrated brochures which give complete prices and specifications on Procunier High Speed Tapping Heads and Machines.
Name.....
Address.....
City.....Zone.....State.....

NEW, TYPE-DX

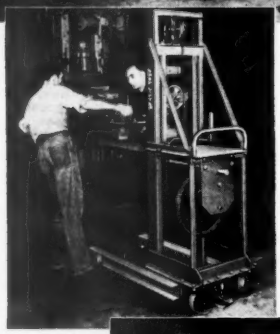
HEAVY DUTY

Shoplifter

Two Capacities

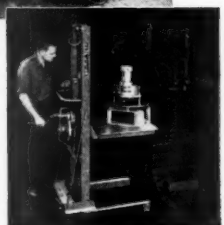
2000 lbs. and 1000 lbs.

A larger, huskier version of the popular Type D 500 lb. Shoplifter, but retaining the easy handling features of the smaller lifter. Platform and base frame have an overall width of 24" that allows easy passage in narrow aisles, between presses, and through doorways. Hoisting unit is ball bearing equipped. Automatic friction-disc brake holds load at any point, not necessary to set or release pawl or brake device. Only 20 lbs. pressure is required on crank handle to raise or lower load. Extra heavy construction gives rigid stability that enables the operator to handle maximum loads with ease and smoothness. No other lifter of equal capacity on the market can match the Shoplifter for value. One user said: "It's a lot of machine for the money."



SPECIFICATIONS

CAPACITY—1000 lbs. and 2000 lbs.
OVERALL HEIGHT (to clear)—6'8".
PLATFORM LIFT—54".
PLATFORM PLATE—24" wide x 27½" long (30" out from uprights).
BASEFRAME—24" wide x 50½" long overall. Open end front.
BASE WHEELS—5" fixed wheels, 6" swivel casters with push bar steer.
HOIST UNIT (two capacities)—Ball bearing equipped, crank up and down action, automatic safety brake holds load at whatever point raised. Drum scored for cable.
PAINTED—Standard olive green finish.
PRICE—1000 lb. capacity.....$320.00
2000 lb. capacity.....$370.00
f.o.b. Chicago, freight prepaid to any destination in U.S.
Heavy duty foot operated floor lock.....$15.00 Extra



Shoplifter Type D Capacity 500 lbs. Price $157.50

ECONOMY ENGINEERING CO.

2635 West Van Buren Street, Chicago 12, Illinois

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PUBLICATION PREVIEWS

Keep Informed! CATALOGS • BULLETINS • SPECIFICATIONS

Circle postage-free Inform-a-Gram Key Number for your request

"STAINLESS PLATES, SOLID AND CLAD, AND THEIR FABRICATION" is a booklet recently published by Allegheny Ludlum Steel Corporation to acquaint users with Allegheny metal plates and increase the scope of knowledge on the subject. This informative book is divided into sections covering solid stainless plates; surface finish and conditions; standard permissible variations for dimensions and workmanship; Allegheny metal stainless steel plate fabrication and clad plate fabrication; ASTM and ASME boiler code (solid and clad); and general information required for quotations. This book is available at ALLEGHENY LUDLUM STEEL CORP., Dept. 678, Oliver Bldg., Pittsburgh, Pa., or circle **Inform-A-Gram Key No. B9.**

BELT GRINDING AND FINISHING WITH IDLER BACKSTANDS is discussed in a new pamphlet published by Behr-Manning. The pamphlet contains many illustrations of the various models of Idler Backstands—floor, wall, ceiling and bench—and their many applications. The great increase in production that is brought about by the use of Idler Backstands is discussed, and explained in detail. Also included is condensed information on coated abrasives and oilstones. Send for your free copy to BEHR-MANNING, Dept. 110, Troy, N. Y., or circle **Inform-A-Gram Key No. B10.**

THE LANDIS 6" PLAIN HYDRAULIC GRINDER, Type CH, is clearly pictured and defined in a 16-page catalog recently published by Landis Tool Company. Many close-up photographs of the various parts and attachments clarify the machine's operations. The catalog has much interesting information on the machine's special design features, its performance, application and general operating procedure. Line drawings and specifications are also included. LANDIS TOOL CO., Dept. 355, Sixth & Ringgold Sts., Waynesboro, Pa. **Inform-A-Gram Key No. B95.**

"AVOID DANGEROUS SCRAPES", a new bulletin (No. 93) issued by Ampco Metal, Inc., stresses the importance of using bronze scraping tools when cleaning in hazardous locations. These tools minimize the danger of fires and explosion when used around explosive fumes, gases, and liquids. The folder illustrates and describes seven tools and a "Spray Booth Kit"; also a new type bronze floor scraper. Ampco has over 500 non-sparking bronze tools available. In another bulletin (No. 85) the Ampco centrifugal pump is illustrated and its construction details and characteristics are given. Made of durable aluminum bronze, it has a strong resistance to corrosion—giving long and trouble-free service in handling acids, salts, alkalies, etc. It is a production-built machine, and production priced. Send for these bulletins to AMPCO METAL, INC., Dept. 956, 1745 S. 38th St., Milwaukee 4, Wis. **Inform-A-Gram Key No. B96.**

23 RUST PREVENTIVE COMPOUNDS, and their applications, are explicitly described in a 14-page booklet recently published by Freedom-Valvoline Oil Company. All the compounds are classified and brief comparisons are made of the compounds in each group. Methods of application, thicknesses and permanency of coatings, and removal are all thoroughly discussed. Uses of these compounds cover metals in storage—both indoor and outdoor—and metals between manufacturing operations. To obtain your free copy of this booklet write FREEDOM-VALVOLINE CO., Dept. 39, Freedom, Pa., or circle **Inform-A-Gram Key No. B97.**

SWISS SPECIAL MACHINES AND OPTICAL WORKS are pictured and described in a new catalog released by Hauser Machine Tool Corp., Manhasset, New York, distributors of Hauser Ltd., well-known precision machines for watch and similar industries. Hauser's various types of jig boring machines and jig grinding machines—both high precision tool room machines—are detailed as to capacities and dimensions. Explicit technical data are given. Other Hauser products are also presented, such as measuring microscopes, profile projectors, hardness testers, profiling machines and pivot polishing machines. Send for your copy of the catalog to HAUSER MACHINE TOOL CORP., Dept. 46, 74 Bournedale Rd., N., Manhasset, New York. **Inform-A-Gram Key No. B87.**

PUBLICATION PREVIEWS

A RESISTANCE-WELDING ALLOY CATALOG is now available which depicts Acme Electric Welder Company's complete new line of alloys used in spot welder tips, electrodes, flash and projection welding dies, and seam welder discs. These alloys include Acmeloy, Superloy and Stainaloy. The items included in this comprehensive illustrated catalog are a variety of special goose-neck tips, offset tip holders and seam welder discs, and a complete line of standard tips and alloys. Specifications and prices are included and the catalog (No. 502) is available by writing ACME ELECTRIC WELDER CO., Dept. 56, 2618 Fruitland Rd., Los Angeles 11, Calif., or by circling **Inform-A-Gram Key No. B98.**

HIGH-SPEED REAMERS made by an entirely new rolling process are presented in a complete price list by their manufacturer, U. S. Tool & Manufacturing Company. The cutter blades of high cost, high speed steel are firmly secured in recesses of a tool body of low cost carbon steel by means of a patented procedure. This process involves no application of heat as in welding and therefore the temper, hardness and durability of the cutter blades are not affected. These new high speed reamers are listed as to size and prices and all are available for delivery within two weeks. Send for the price list to U. S. TOOL & MFG. CO., Dept. 812, 6906 Kingsley Ave., Dearborn, Mich., or circle **Inform-A-Gram Key No. B99.**

Empco JACKS
Set and KEEP Your Machines LEVEL!
Machine Tool Manufacturers strongly emphasize the need, not only to set machines level, but to keep 'em that way. Periodic re-leveling is essential for accurate work tolerances. How often, depends on the type of foundation. No method of machine setting is stable enough to maintain the accuracy of initial leveling. It is important to check after first month of operation, then check periodically and re-level whenever necessary.
When a machine is set on EMPCO JACKS, the whole operation is the work of but a moment: Simply apply a wrench to the "hex" screw head, turn right or left until your level indicator reads "zero."
Saves set-up and re-leveling time
Self aligning on uneven floors
Accurate two-way adjustment
3 SIZES
No. 1—2" normal height
No. 2—2½" normal height
No. 3—3⅛" normal height
EMPCO
THE ENTERPRISE MACHINE PARTS CORPORATION
2735 JEROME AVE. DETROIT 12, MICH.

GLOBE AUTOSTART GRINDERS AND BUFFERS are illustrated and detailed in a new catalog (No. 901) published by Globe Products Manufacturing Co. The advantages of asbestos-protected motors are explained in the catalog, which also contains specifications and other technical data. Send for Catalog 901 to GLOBE PRODUCTS MFG. CO., Dept. 305, 3380 Robertson Ave., Los Angeles 34, Calif., or circle **Inform-A-Gram Key No. B16.**

THE PRESSED METAL INSTITUTE has published a 1948 supplement to Volume Four of "The Blue Book of Stamping Manufacturers" and it is now available to buyers of stampings. Many requests are being received for the Blue Book from Ordnance and War Department offices, automobile firms and other manufacturers seeking sources of supply for stampings. Listed in the supplement are names and facilities of members who joined the Institute since October 1947, as well as present officers. Write the PRESSED METAL INSTITUTE, Dept. 31, 829 Union Commerce Bldg., Cleveland, Ohio, or circle **Inform-A-Gram Key No. B25.**

PLEASE USE INFORM-A-GRAM FOR PRODUCT INFORMATION

THREE DISTINCT TYPES OF PRECISION TOOLS of high-speed steel are offered by Bokum Tool Co., Detroit, in a new catalog (No. 1139-6). Style A is for general boring, Style B for bottoming and facing, and Style C for internal threading. A new boring tool has been added to the Style A line—No. 00000 which can bore $\frac{1}{16}$" holes; and a new size added to Style B which permits facing and bottoming of $\frac{1}{16}$" holes. All three styles come in small sizes (Nos. 00000 to 3) in one piece tools; and larger sizes (Nos. 4 to 12) which consist of a high-speed steel head screwed to an alloy steel shank. The catalog lists the tools, their dimensions, and includes photographs of the various complete sets offered by BOKUM TOOL CO., Dept. 43, 14775 Wildemere, Detroit 21, Mich. **Inform-A-Gram Key No. B86.**

PUNCH PRESSES of the open back inclinable type manufactured by Diamond Machine Tool Company are illustrated and described with complete specifications and engineering data in a new 12-page three-color catalog. Drawings showing the frame, bed and ram dimensions; engineering data on SR-4 strain gage analysis and dynamic tests as applied to Diamond punch presses; and instructions for calculating punch press capacity. Write DIAMOND MACHINE TOOL CO., Dept. G, 3429 E. Olympic Blvd., Los Angeles 23, Calif., or circle **Inform-A-Gram Key No. B26.**

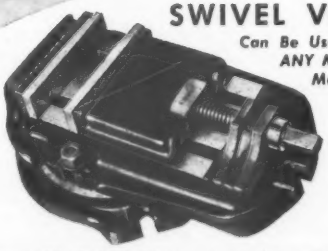
TALIDE TUNGSTEN CARBIDE TOOLS AND TIPS are presented in a newly revised tool catalog (No. 48-T) published by Metal Carbides Corporation. Several new styles and sizes are listed, and all tools and tips are identified by the standard numbers recently adopted by the carbide industry. Send for Catalog 48-T to METAL CARBIDES CORP., Dept. 717, 107 East Indianola Ave., Youngstown 5, Ohio, or circle **Inform-A-Gram Key No. B22.**

NEW COLOR PROGRAM FOR SIMPLE TOOL STEEL IDENTIFICATION is available to tool and die steel users from The Carpenter Steel Co. Matched tool and die steels are now painted full length to insure positive identification. To further simplify selection and identification of the proper steel, a new 21" by 31" Wall Chart will be available containing a 12-color reproduction of the Carpenter Matched Set Diagram and show the new color markings for each tool and die steel. Large arrows show the user how to travel on the Diagram to select the right steel for the job. Send for the new Tool Steel Selector and Identification Wall Chart to THE CARPENTER STEEL CO., Dept. 38, 122 West Bern St., Reading, Pa., or circle **Inform-A-Gram Key No. B2.**

CUT MILLING COSTS with KEMPSMITH STANDARD ATTACHMENTS

SWIVEL VISE

Can Be Used on ANY Milling Machine



Kempsmith Swivel Vises are precision tools with operating surfaces accurately ground to size and squareness. Jaws are removable and coolant return channel cast integral. Built to take hard, everyday punishment. Plain vises and heavy duty plain and swivel vises, also available. Ask for Bulletin No. 117.

Kempsmith Standard Attachments **broaden the scope of your milling machine . . . lower capital investment . . . save in set-up time.**

KEMPSMITH ARBORS

in all popular sizes or types. Adaptable to ANY make of milling machine with standardized spindle.

KEMPSMITH MACHINE CO.
1829 SOUTH 71st STREET
MILWAUKEE 14, WIS., U. S. A.

KEMPSMITH

Precision Built Milling Machines Since 1888

SEE ADVERTISERS INDEX, PAGE 83, FOR KEY NUMBERS

TYPE HMV, A SWEDISH MILLING AND HORIZONTAL BORING MACHINE, is illustrated and thoroughly described in a brochure put out by Central Industries, Ltd. Construction details, technical data, capabilities and specifications are clearly presented in the brochure which is available at CENTRAL INDUSTRIES, LTD., Dept. 76, 30 Church St., New York, N. Y., or circle **Inform-A-Gram Key No. B8.**

HYDRAULIC PRESSES FOR STRAIGHTENING both rough and finished work are presented by Colonial Broach Company in a bulletin (No. PS-48). Among the various presses which are described is the new Model PS-75-12 straightening press with a 75-ton capacity and a 12-inch stroke. This press will accommodate the largest work usually requiring straightening operations. Bulletin available at COLONIAL BROACH CO., Dept. 26, Box 37, Harper Station, Detroit, Mich., or circle **Inform-A-Gram Key No. B7.**

THE NEW FOX SWING FRAME CUT-OFF MACHINE is portrayed in Fox Grinders, Inc., new illustrated brochure. Designed to take full advantage of the new flexible-type cut-off wheels, it is especially recommended by the manufacturer for removing sprues and risers from bronze, aluminum, and iron castings. It has full maneuverability through 180°. Powered by a 7½ h.p. enclosed fan-cooled ball-bearing motor, it accommodates wheels 16" x $\frac{3}{32}$" x 1" and weighs around 400 pounds. The brochure includes photographs and specifications and may be had by writing FOX GRINDERS, INC., Dept. 58, Oliver Bldg., Pittsburgh 22, Pa., or by circling **Inform-A-Gram Key No. B5.**

Save many man hours, conserve valuable tools and dies and minimize production delays with the aid of EUREKA TOOL and DIE WELDING ELECTRODES. Here's how it can be done:

1 REPAIRING DIES. . . . Existing units that may fail in operation can be EUREKA welded, either partially or wholly, resulting in a minimum of "down-time."

2 COMPOSITE FABRICATING. . . . Die units can be compositely fabricated, when practical, by EUREKA welding, resulting in numerous advantages.

3 CORRECTING DESIGN. . . . EUREKA welding facilitates making changes in contour, corners or edges during die "try-out" or "change-over" periods.

4 RECTIFYING ERRORS. . . . EUREKA welding permits the correction of errors made in tool and die manufacturing, resulting in great savings. *Write for Literature*

WELDING EQUIPMENT & SUPPLY CO.
225 LEIB STREET • DETROIT 7, MICHIGAN

A NEW RACK COATING, known as Micrcosol E-1003, has been introduced by Michigan Chrome & Chemical Co., in a new bulletin now available. This new Micrcosol E-1003 is a 100% solids heat-cured rack coating that produces a tough, smooth, leather-like coating with a single application. Send for a copy to MICHIGAN CHROME & CHEMICAL CO., Dept. 997, 6340 East Jefferson Ave., Detroit 7, Mich., or circle **Inform-A-Gram Key No. B21.**

CONTRACT METAL STAMPINGS, drawn steel wheel guards, and wheel guards are all discussed in a 25th Anniversary brochure put out by Morrison Products, Inc., including photographs, diagrams and construction details of the different products, as well as photographs of actual job applications. Copies of this brochure are available at MORRISON PRODUCTS, INC., Dept. 61, East 168 and Waterloo Rd., Cleveland 10, Ohio, or circle **Inform-A-Gram Key No. B24.**

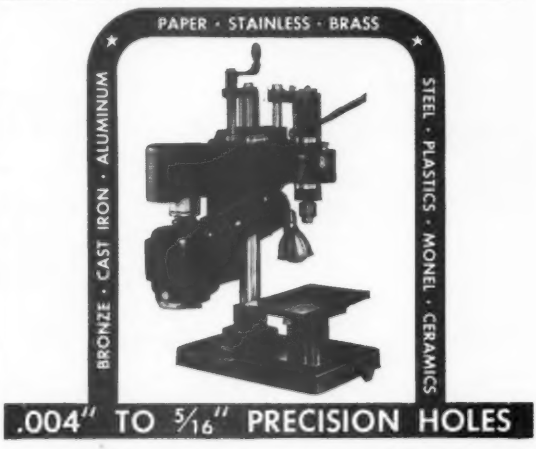
PLEASE USE INFORM-A-GRAM FOR PRODUCT INFORMATION

FOR FAST, POSITIVE CLAMPING IN PUNCH PRESS WORK, plastic molding, machining, testing, welding and almost every industry, Danly Machine Specialties, Inc., offers its "Kwik-Klamp" toggle clamps. These efficient, time-saving clamps are fastened or released in a single motion and can obtain any angle at the point of clamping. These clamps are presented in a new folder which includes photographs of the different and varied applications. Also offered by Danly in another folder are complete lines of die springs — of medium pressure with high deflection, and high pressure with medium deflection. Valuable downtime wasted in replacing a die spring is saved with these long-wearing, high-quality steel springs. In two other folders, Danly presents its 1-, 2-, and 4-point straight-side presses and its die sets. Profusely illustrated, the folders contain useful technical data and descriptions of job applications. All four bulletins are available from DANLY MACHINE SPECIALTIES, Dept. 56, 2100 S. 52nd Ave., Chicago 50, Ill. **Inform-A-Gram Key No. B83.**

POLISHING SUPPLIES OF ALMOST EVERY TYPE are offered in a catalog by W. F. Bollen Co., New York City. Felt cones of standard sizes—blunt or pointed—are listed as to size and price. Knife edge wheels, square edge wheels, mounted bristle brushes, wheel brushes, muslin polishing buffs, polishing sticks and many other supplies are pictured, size-listed, and priced. Send for a copy to W. F. BOLLEN CO., Dept. 45, 1 East 42nd St., New York 17, N. Y. **Inform-A-Gram Key No. B85.**

CARBIDE TOOL GRINDERS is the title of Catalog No. 220 recently published by Hammond Machinery Builders, Inc. Chip breaker grinders, diamond finishing grinders, and carbide tool grinders are clearly illustrated and detailed. The catalog also contains helpful hints on grinding carbide tools. Send for your free copy to HAMMOND MACHINERY BUILDERS, INC., Dept. 95, 1631 Douglas Ave., Kalamazoo, Mich., or circle **Inform-A-Gram Key No. B13.**

A NEW BULLETIN DESCRIBING PLASTICS MOLDING MACHINES has been released recently by The Hydraulic Press Manufacturing Co., which will prove invaluable as a source of factual information on the subject. Illustrations of the machines, their use in actual job applications, and the many products produced on the machines are included. Send for your copy to THE HYDRAULIC PRESS MFG. CO., Dept. 328, Mount Gilead, Ohio, or circle **Inform-A-Gram Key No. B19.**



.004" TO 5/16" PRECISION HOLES

IN *all* DRILLABLE MATERIALS

If your job is to drill small, precision holes in hostile material try the Hamilton Varimatic Drill. It's super-sensitive; and the speed is infinitely variable between 840 and 9300 R.P.M. Clearances and travel are ample for all work of medium size. 80% of present installations are repeat orders. The reason for this popularity is built into the machine. Our Bulletin V-47 "tells all". Write for it!

THE Hamilton TOOL COMPANY

SUPER SENSITIVE DRILLING MACHINES
TAPPING MACHINES · PORTELEVATORS

832 SO. NINTH STREET · HAMILTON · OHIO · U · S · A

SEE ADVERTISERS INDEX, PAGE 83, FOR KEY NUMBERS

THREE DIFFERENT KINDS OF GROUND FLAT STOCK are featured in a new color catalog just off the press of Marshall Steel. These new kinds of ground flat stock are water-die, air-die, and oil-die. Interesting technical data concerning these stocks is included in the catalog, and their various applications are explained. Send for your copy to MARSHALL STEEL, Dept. 41, Box 58A, Lisle, Ill., or circle our postage-free **Inform-A-Gram Key No. B15.**

HIGH SPEED SENSITIVE MULTI-DRILLERS AND TAPPERS are photographed with complete specifications in a new 20-page two-color catalog released by The National Automatic Tool Company. Natco H-5 and H-6, both heavy duty and standard, multi-spindle drillers and tappers are described in detail as to construction, capabilities and production records. This catalog is available by writing THE NATIONAL AUTOMATIC TOOL CO., Dept. 69, 7th and North Sts., Richmond, Ind., or by circling **Inform-A-Gram Key No. B18.**

"HANDY DATA ON BRASS FITTINGS" is a new folder describing Imperial Brass' various types of fittings, illustrating them and listing them as to size and price. One of the features of the folder is a "How to Recognize" section which gives cross-sectional views of fitting joints, and disassembled views. Folder is available by writing IMPERIAL BRASS MFG. CO., Dept. 59, 1200 W. Harrison St., Chicago 7, Ill., or by circling **Inform-A-Gram Key No. B20.**

THEY STAND ABUSE!
These
"EDUCATED DIAMONDS"
can't come loose!
How would you like a dresser that really *holds* its diamonds?
Here's one that will do it—thanks to its matrix of Carboloy Cemented Carbide.
What's more, this special carbide matrix makes it possible to use small, inexpensive diamonds—and *you* get the savings.
Are you interested in savings of up to 40% in your dressing costs? Let us send you our free brochure, "The More Profitable Use of Diamonds for Dressing Grinding Wheels." Ask for brochure No. DR-480. *Carboloy Company, 11111 E. 8 Mile Blvd., Detroit 32, Mich.*
DIAMOND DRESSERS
by CARBOLOY ®

GARRISON GEAR CHUCKS, for bevel, spur, helical, internal, herringbone, and cluster gears, are presented in a new folder available now at Garrison Machine Works, Inc. The folder contains interesting information on the construction details of Garrison gear chucks, and their accuracy, range, and long wearing ability. Send for free copy to GARRISON MACHINE WORKS, INC., Dept. 85, Dayton 4, Ohio, or circle our postage-free **Inform-A-Gram Key No. B17.**

MORSE MORFLEX FLEXIBLE COUPLING LINE is thoroughly discussed in Morse Chain Company's new 32-page catalog. The catalog, No. C41-48, contains interesting information on the development of couplings, their construction and working principle. Morflex couplings are made in capacities ranging from .06 to 13.80 horsepower rating per 100 rpm. Catalog C41-48 is available by writing MORSE CHAIN CO., Dept. 60, 7601 Central Ave., Detroit 8, Mich., or by circling **Inform-A-Gram Key No. B23.**

PLEASE USE INFORM-A-GRAM FOR PRODUCT INFORMATION

Hammond
OF KALAMAZOO

Model "400"

HORIZONTAL or VERTICAL

4" ABRASIVE BELT GRINDER

Eliminate costly hand filing, grinding, deburring and many other operations . . . There are "101" applications for the 400 in your plant. Write for bulletin.

Hammond Machinery Builders

1631 DOUGLAS AVENUE • KALAMAZOO 54, MICHIGAN

BAUMBACH

35 YEARS OF DIE SET MAKING

THE DIE-SET AUTHORITY

All Baumbach Die-Sets have demountable Leader Pins and Bushings. This exclusive feature permits removing leader pins for machine work on the die shoe and assures reassembly without loss of alignment. A big time and trouble saver. Write for Catalog.

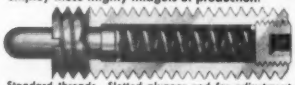
E. A. BAUMBACH MFG. CO.
1814 S. KILBOURN AVE. CHICAGO 23, ILL.

SMALL *BUT* MIGHTY

SPRING PLUNGERS

Completely Unitized
ARE SERVING INDUSTRY IN A *BIG* WAY

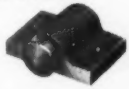
Industrial leaders, manufacturers of Air-Craft, Automotive, Electrical Appliances, Farm Equipment, Radio, Optical Goods, Office Machines, and many others, use and endorse Vlier products — in fact, in every branch of industry, wherever positive accurate spring-tension plunger action on jigs, fixtures and die work is required, Vlier products are accepted as standard. You, too, can profitably employ these mighty midgets of production.



Standard threads. Slotted plunger end for adjustment, top or bottom. Hardened round nose plunger telescopes within body, permits easy insertion of workpiece. Spring maintains tight, positive end pressure of 5 to 42 lbs. Rust-proofed. Individually boxed.

SPRING STOPS

Used where no wall sections are available. Bolted to fixture base through drilled flanges. Hardened plunger end provides 14 lbs. pressure. Rust-proofed. 6 to a box.



TORQUE THUMB SCREWS

End pressure automatically limited, provides accurate holding tension. No work distortion, costly rejects, or expensive fixture rework. Individually boxed.
17 sizes offer various types and end pressures.

MULTI DIMENSIONAL FIXTURE KEY

Counterbored hex nut having stepped sides. Milled to maintain tolerance of ±.0005 between sides, — assuring perfect alignment. Each pair of sides form three individual key widths which fits standard table slots. Two Keys, in any fixture, can be used on three machines having varying slot dimensions.

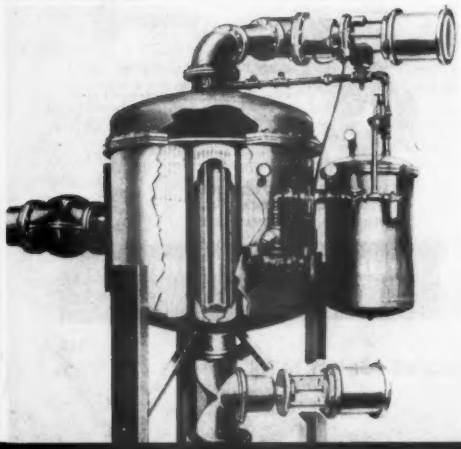
WRITE TODAY FOR DETAILED LITERATURE AND LOCATION OF NEAREST VLIER SUPPLY HOUSE

VLIER MANUFACTURING CO.
Manufacturers of Production and Tool Specialties
4552 BEVERLY BLVD., LOS ANGELES 4, CALIFORNIA

SEE ADVERTISERS INDEX, PAGE 83, FOR KEY NUMBERS

PROGRESS

NEW DEVELOPMENTS • IMPROVEMENTS • COST AND TIME SAVERS



CIRCLE KEY NUMBERS ON POSTAGE-FREE INFORM-A-GRAM INSERT FOR FURTHER INFORMATION

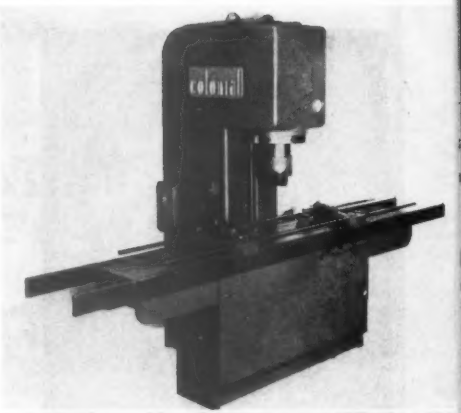
NEW CINCINNATI DIAL-TYPE MILLING MACHINES are now built in medium and high speed ranges; plain, universal, and vertical styles; and in three sizes of each style. Shown in the photograph at left is Cincinnati's No. 2 Plain Dial-Type Milling Machine. A large variety of work may be assigned to these machines, due to the dial-type convenience and ease of operation. Speeds and feeds, indicated on large direct-reading dials nested together, are changed by power with a single finger-tip control lever. A speed calculator provides for the correct spindle speed before the cut is started. Feed and rapid traverse control levers are independent and directional. Lubrication is, for the most part, automatic. Send for Catalog No. M-1623 describing these new milling machines to THE CINCINNATI MILLING MACHINE CO., Dept. 233, Cincinnati 9, Ohio, or circle our postage-free **Inform-A-Gram Key No. A15.**

TAPER SHANK DRILLS have been added to Super Tool Company's standard line of carbide-tipped twist drills. Taper shanks are now available in the same sizes as straight shanks, ⅛" to 1". Super's new addition is a step for which the industry has felt the need with the growing use of carbide in drilling. There have been new sizes added to Super's standard line of carbide-tipped and solid carbide drills —both taper shank and straight shank. The drill at the top of the photograph at left is one of Super's new taper shank carbide-tipped twist drills. New literature is available on Super's complete line by writing SUPER TOOL CO., Dept. 168, 21650 Hoover Road, Detroit 13, Mich., or by circling our postage-free **Inform-A-Gram Key No. A17.**

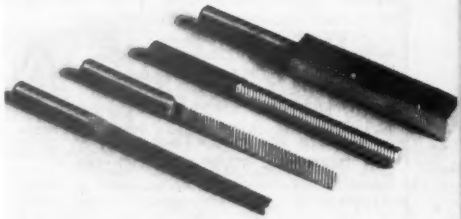
THE HONAN-CRANE AUTOMATIC CLARIFIER, shown in the photograph at left, provides machine tools with a continuous supply of clean coolant, thereby accomplishing many major savings such as increased tool life, elimination of individual pumps and motors, fewer rejects, elimination of hand labor to clean tool sumps and lines. This clarifier automatically removes abrasives, dirt and other solid contamination from water soluble coolants used in grinders, broaches, boring machines, milling machines and other metal working machine tools. Seven sizes are available ranging from a single tube model to one with 37 tubes. For sizes, specifications, dimensions write to HONAN-CRANE CORP., Dept. 322, 208 Indianapolis Ave., Lebanon, Ind., or circle **Inform-A-Gram Key No. A12.**

ON PARADE

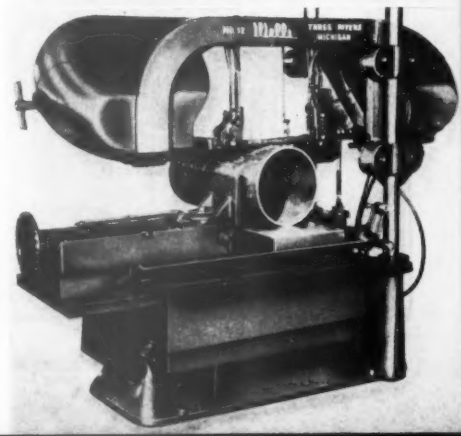
A 75-TON HYDRAULIC STRAIGHTENING PRESS has been added to Colonial Broach Company's line. This heavy duty press (shown in photograph at right) is designed for handling both finished and rough work, and has a double rail straightening fixture to take care of the larger and heavier work. Rugged reinforced welded steel construction is used for the open side frame. Motors are built-in. Rams are direct acting from high capacity hydraulic cylinders mounted in the head, and are available with bronze ram noses in place of the standard steel design, if desired—as are the work support anvils. The work supports may be either center or roller type, depending upon the type of the work to be handled. Guide rails are extra long to prevent sagging of long work beyond the work anvils. For specifications and further details write to COLONIAL BROACH CO., Dept. 26, P.O. Box 37, Harper Station, Detroit, Mich., or circle our postage-free **Inform-A-Gram Key No. A14.**



GROUND CARBIDE DIE-MACHINE FILES are now being manufactured by Severance Tool Industries, Inc., for making alterations or corrections on hardened dies without the risks involved in annealing and rehardening. These ground carbide files finish faster than the unground type, and will outlast scores of the conventional type of files on the usual run of operations. They can be used successfully on any material where a relatively straight surface is to be worked. When used on production parts it is possible to increase output from double to 10 times the former amount. Severance offers these in four standard shapes: round, square, rectangular, and triangular. Send for Bulletin 16-DF describing these files to SEVERANCE TOOL INDUSTRIES, INC., Dept. 46, 730 Iowa St., Saginaw, Mich., or circle **Inform-A-Gram Key No. A16.**

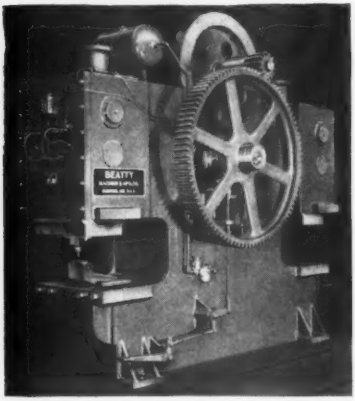


A HEAVY DUTY METAL SAW WITH WET CUTTING SYSTEM has been announced recently by Wells Manufacturing Corp. Two outstanding features of this new Wells No. 12 are the automatic cutting cycle and electrically controlled blade pressure. The wet cutting system which is installed as an integral part of the saw includes a chip pan, fluid tank, centrifugal-type pump-motor unit, splash guards and protective screens. The chip pan is mounted firmly between bed and base. All the working parts are readily accessible and a convenient valve permits adjustment of flow. Further information may be obtained by writing WELLS MFG. CO., Dept. 156, 1940 Ash St., Three Rivers, Mich., or by circling our postage-free **Inform-A-Gram Key No. A13.**



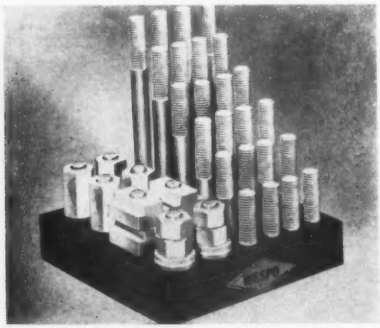
PROGRESS ON PARADE

WELDED STEEL CONSTRUCTION and shortened distance between punching centers are two of the new features of the Beatty Machine and Manufacturing Company's #9 Double End Punch. This entirely new principle of design finds the original 12-foot distance between punching centers reduced to 9 feet.



The shortened machine is more rigid, occupies less floor space, and meets more satisfactorily the rugged requirements of high production manufacture. Added features of the new #9 are centralized lubrication, air counterbalance of the ram and an architectural table with front filler block to convert to plain table. BEATTY MACHINE AND MFG. CO., Dept. 49, 954 150th St., Hammond, Ind. **Inform-A-Gram Key No. A56.**

AN IMPROVED STUD AND NUT SET, conveniently arranged for easy selection, is now in production at West Point Manufacturing Co., Farmington, Michigan. The sets are available in ¾", ⅝", and ½" standard thread sizes—class 3 fit. Each set includes 4 each of 3", 4", 5", 6", 7", and 8" studs; 4 each of the nuts, washers, T-slot nuts, and coupling nuts. Lengths from 3" to 16" may be obtained with the coupling nuts. The specially designed and machined T-slot nuts allow for the use of studs to the full capacity of the T-slot. They are made of heat-treated alloy steel—other parts are hardened for long wear and all parts are cadmium plated. The sets come in a handy wooden base as shown in the above photograph. WEST POINT MFG. CO., Dept. 67, 19631 Merriman Court, Farmington, Mich. **Inform-A-Gram Key No. A85.**



AUTOMATIC CENTER PUNCH with accessories has been introduced by Vinco Products. This automatic punch comes in two models: No. C-15 which is adjustable from 9 to 20 pounds pressure, and No. C-12 which is preset to 15 pounds. The internal, spring-actuated hammer that strikes the point is released upon specified hand pressure and will indent any unhardened metal. New design features include a plastic handle for maximum hand

comfort, unusually light weight and length for maximum accuracy, and "shock absorber action" for especially delicate work. These punches may be bought separately, or in a kit complete with five attachments—a self-centering attachment, a tungsten-carbide point, a hole-cutting point, a chisel point, and a hammer point. For further information write VINCO PRODUCTS, Asbury & Langford Sts., Asbury Park, N. J., or circle **Inform-A-Gram Key No. A81.**

Announcing NEW . . .

AIR-DIE

GROUND FLAT STOCK

Now Available From Stock

Write for New Catalog . . . Just off the Press

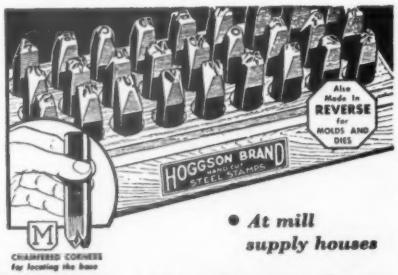
BOX 58-A

MARSHALL STEEL
LISLE, ILLINOIS

HOGGSON BRAND
Since 1849

HAND-CUT
Steel Stamps
Letters and Figures

Deep, hand-cut letters in special-formula steel—result of 90 years of die making—assure clean impressions and long service. Face of stamp is angled for extra strength. Ideal for parts and tool marking and numbering. Also made in reverse for marking molds and dies.



CHAMFERED CORNER for locating the base

• *At mill supply houses*

HOGGSON & PETTIS MFG. CO. • New Haven, Conn.

SEE ADVERTISERS INDEX, PAGE 83, FOR KEY NUMBERS

PROGRESS ON PARADE

A PUNCH HOLDER REMOVER, for easy and labor-saving removal of die punch holders from die beds with guide pins, has been developed recently by The Producto Machine Co., Bridgeport, Conn. It may also be

used for separating assembled punches and dies, and for shearing-in small punches and dies. Another operation for which it can be used is tryout work on light gauge material. For further details on this handy and versatile machine, write to PRODUCTO MACHINE CO., Dept. 91, 990 Housatonic Ave., Bridgeport 1, Conn. **Inform-A-Gram Key No. A60.**

"WALKIE", FOR LOADING DIES AND MOLDS INTO PRESSES, is a new 4000 pound capacity truck manufactured by The Yale & Towne Mfg. Co. Electrically operated, the "Walkie" can pick up the die or mold from place of storage, transport it to the press, lift it level with the press platen, then load it into position for use. The platform is of roller construction and built in three sections so that an extra heavy weight will not bend

the rollers. The loading arrangement permits the operation to be entirely mechanical —no manual tugging or pulling is necessary. The lift mechanism is adjustable to any height. Write to YALE & TOWNE MFG. CO., Dept. 978, 4530 Tacony St., Philadelphia 24, Pa. **Inform-A-Gram Key No. A45.**

NEW 12 TON PRESS ADDED TO PRESS-RITE LINE has been anounced by Sales Service Machine Tool Co., This new No. 12 has several new features which have also been added to the entire line of Press-Rite Presses. The entire line, with the exception of No. 0, is built with anti-friction roller bearings in the flywheels. The flywheels

have been changed and the weights have been equalized throughout the line. Another improvement is the newly designed positive single stroke clutch—there is only one spring in the whole clutch mechanism, the spring which engages the clutch dog into the clutch drive ring. This clutch can be used either for continuous operation with automatic feeds or operated as a positive single stroke clutch. All Press-Rite presses now come equipped with a special cam-actuated automatic brake. This combination of a single stroke clutch and automatic brake is an important safety feature built into this punch press. SALES SERVICE MACHINE TOOL CO., Dept. 452, 2363 University Ave., St. Paul 4, Minn. **Inform-A-Gram Key No. A41.**

"The STANDARD of COMPARISON for QUALITY and ACCURACY"

• QUALITY
• SERVICE

IMMEDIATE DELIVERY!

DRILL JIG BUSHINGS

Precision made from finest oil hardened tool steel — ASA Standard — featuring concentric ground lead to insure perfect alignment. Complete stocks maintained at all times by exclusive distributors throughout the U. S. and Canada, for immediate free delivery.

SEND FOR FREE CATALOG A

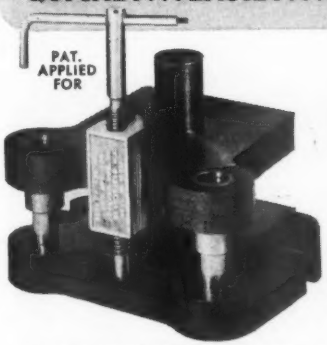
American Drill Bushing CO., INC.

1110 So. Santa Fe Avenue, Los Angeles 21, Calif.
SPECIALIZING ONLY IN DRILL BUSHINGS

DIE SETS SEPARATED AND ASSEMBLED QUICKLY...EASILY...SAFELY...WITH THE NEW

PERSSON DIE JACKS

PAT. APPLIED FOR



Eliminate old-fashioned, unsafe prying or hammering methods in your shop. Just clamp on punch holder and turn handle. Punch holder is raised or lowered smoothly — always under control. Die Jacks are made from fine steel and alloys. They are precision built tools every tool maker will want for his tool box or bench drawer.

NO PRYING OR HAMMERING —EASY DOES IT EVERYTIME!

A few good territories still open for representation. Write for details and literature.

T. G. PERSSON MFG. CO., 224 GLENWOOD AVE., BLOOMFIELD 4, N. J.

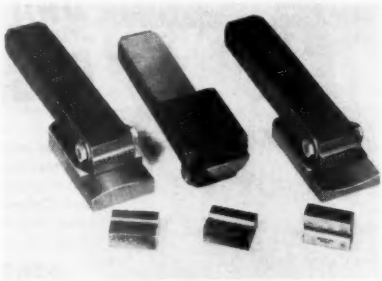
SEE ADVERTISERS INDEX, PAGE 83, FOR KEY NUMBERS

PROGRESS ON PARADE

THE INDIANA FOUNDRY, MACHINE & SUPPLY COMPANY announces its new No. 620 RP press and No. 420 RP press for the forming and draw-molding of sheet plastic materials; i.e., acetate, Vinylite, and the arcylics. The Indiana No. 420 RP press has a platen area designed to handle the average range of die size requirements based on standard sheet working areas. The Indiana No. 620 RP press provides a platen area large enough to accommodate forming dies and sheet areas of a length greater than the press bed. Both presses are equipped with a new rack and pinion installation on the movable platen and uprights. This provides positive support and smooth, true alignment of the movable

platen. This feature insures uniformity of pressure over the entire movable platen area and true mating of the form draw working dies. INDIANA FOUNDRY, MACHINE & SUPPLY CO., Dept 22, 1400 N. Washington St., Marion, Ind. **Inform-A-Gram Key No. A57.**

GEARS, SLEEVES, TUBING, AND BUSHINGS can now be easily and accurately hand stamped around a flat radius with such standard information as heat treat codes, batch numbers and part numbers. This is made possible by the new, inexpensive line of "locating guide" stamping devices for annular marking which have been developed by New Method Steel Stamps, Inc. The new annular marker consists of a holder, a solid logotype bearing the desired characters, a clamping pin, and the locating guide. These locating guides can be set to mark either from the OD or ID. The grooved logotype fits neatly into the handle and is held with the clamping pin. The locating guide is attached to the holder with Allen screws. To insure perfect alignment in operation, guide is placed against the OD or ID of the part to be marked. All parts of the guided annular markers are made of tool steel, hardened and tempered to withstand



hard usage. NEW METHOD STEEL STAMPS, INC., Dept. 122, 147 Jos Campau, Detroit 7, Mich. **Inform-A-Gram Key No. A55.**

A HI-FREQUENCY UNIT FOR ELECTRIC WELDERS of either AC or DC current has recently been introduced by the Tri-Arc Corp., Chicago. A more constant flow of current due to the extra impulses it superimposes provides greater welding ease and more constant control of the arc. Overhead welding, and welding of lightweight metals are simplified by this "Pilot Arc", and the old scratching method is eliminated. The unit has a direct coupling coil which permits the use of a lower current transformer. This gives it a

longer life, greater production and less frequent adjustment of points. For further details write TRI-ARC CORP., Dept 16, 6859 S. Anthony Ave., Chicago 37, Ill. **Inform-A-Gram Key No. A44.**

YOST DRILL PRESS VISE

This new Yost vise has been designed expressly for use on drill press operations. Does away with special and costly jig fixtures.

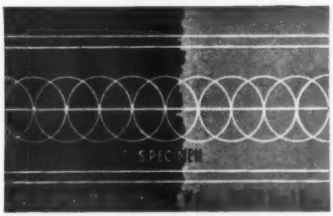
Offered in two sizes

Vise No.	Width of Jaw, Inches	Opens Inches	Weight Pounds
1D	3½	4	12½
2D	5	5½	23

Do you need a vise of ANY type?

Write today for bulletin on the extensive Yost line

YOST MFG. COMPANY
1000 MAIN STREET
MEADVILLE • PENNSYLVANIA



DYKEM STEEL BLUE *STOPS LOSSES*

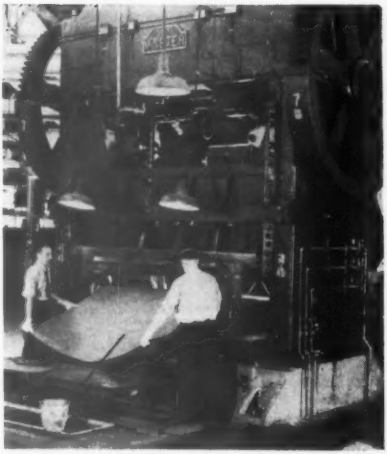
making dies and templates

Simply brush on, ready for the layout in a few minutes. The dark blue background makes the layout lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

Write for full information.

THE DYKEM COMPANY
2303L North 11th Street **St. Louis, Mo.**

IS YOUR PRESS WORK STRENUOUS?



STRENES METAL **cast dies are the right tools for severe drawing and forming jobs—large stampings like airplane propeller blades . . . heavy stampings like wheel rims and tractor seats.**

The users of *STRENES METAL* dies include manufacturers of appliances, airplane parts, automobiles, trucks, tractors, burial caskets and vaults, implements, blowers, etc. Since many of the stampings are extremely large, *STRENES METAL* dies frequently weigh in excess of 10,000 lbs.—sometimes as much as 25 tons.

Whatever your drawing and forming problems may be, put them up to us. It will pay you.

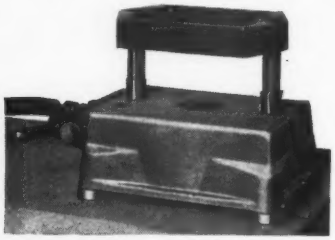
THE ADVANCE FOUNDRY CO.
111 SEMINARY AVENUE
DAYTON 3, OHIO

Strenes Metal
DRAWING AND FORMING DIES

SEE ADVERTISERS INDEX, PAGE 83, FOR KEY NUMBERS

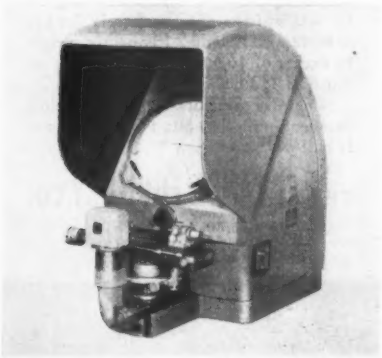
PROGRESS ON PARADE

PNEUMATIC WORK-HOLDING FIXTURE for accurate and fast production in jig drilling, recently announced by Industrial Clutch Corp., Waukesha, Wis., has been proved to be a great time-saver in drilling identical parts. Clamping with air pressure is a quicker, easier operation than clamping by the operator's arm. Variations in thickness of the pieces to be drilled are automatically compensated for by the air pressure, and the pieces are clamped with the same degree of pressure



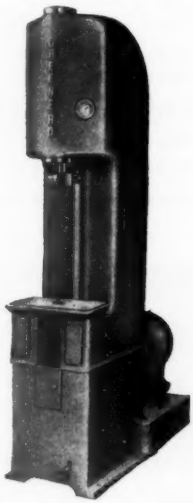
—with no adjustments necessary. This Air-Clamp Jig Base has an aluminum base and a cast iron top plate—jig-drilled with holes for post bolts. It will operate on the air pressures usually available in machine shops and is ready in stock in four sizes—although special sizes can be made to order. INDUSTRIAL CLUTCH CORP., Dept. 37, Waukesha, Wis. **Inform-A-Gram Key No. A7.**

NEW BENCH-TYPE OPTICAL COMPARATORS and measuring machines—available in two basic models—have been designed by Jones & Lamson to cover an almost unlimited field of inspection work. Known as BC-7 and BC-14, the models offer a wide choice in the selection of a machine best suited to individual needs. The BC-14 model, shown in the



photograph, provides a larger lens field and screen area than the BC-7's and has a choice of four table assembly combinations. Magnifications in these models range from 10 to 100. The chart ring is graduated in degrees and minutes, and the handwheel is graduated in .0001". For the elevations, table measurements, and specifications of other BC models, write to JONES & LAMSON MACHINE CO., Dept. 342, 160 Clinton St., Springfield, Vermont. **Inform-A-Gram Key No. A66.**

NEW GREENERD HYDRAULIC PRESSES, known as the G-Line, are rugged, rigid, gap-type presses. The box-type construction, well ribbed, cast of hard Meehanite metal, makes a very strong frame and cuts vibration and deflection to a minimum. There is a G-4, G-6, and G-8 ton press with pressure ranges of ¾, 4, 6, and 8 tons respectively.



Cylinder heads and work tables are separate units—cast of hard Meehanite metal. The work table is removable for convenience in attaching fixtures or for replacing. The ram is controlled with a foot pedal and is equipped with square control rod serrated on the back side and equipped with mating stop collars. Safety electric dual hand control of ram makes it necessary for the operator to use both hands to keep the ram in motion. This is positive protection against the operator's beating the safety feature. GREENERD ARBOR PRESS CO., Dept. 616, 41 Crown St., Nashua, N. H. **Inform-A-Gram Key No. A61.**

The New CROWN E-Z MARK ETCHER

Now you can permanently etch onto any type metal tool or name plate any name or trade mark that can be drawn, typed or written—with the new Crown E-Z Mark Etcher. It's fast, permanent, easy to use, economical and safe. It's the most amazing marking tool ever made for production marking or for individual identification.

To operate, merely place piece to be marked, round or flat, on the previously prepared film—press the button —and presto! it's finished. Anyone can use it, on almost any type of metal, and the mark lasts forever. Each film can be used for marking up to several hundred pieces—so it's economical too. No danger from shock—no acids to injure operator or clothes.

Send for Sample Etching

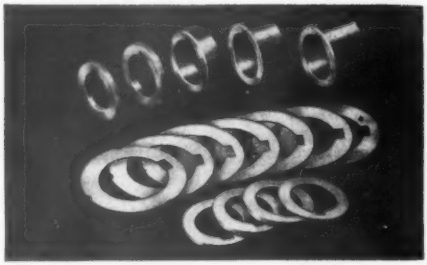
We will be glad to mark one of your products so you can see the quality mark you can make yourself. Send a sample or piece of your material with information you want on it. We'll do the rest.

CROWN *Industrial Products Co.*

1529 East 53rd Street **Chicago 15**

PACKAGED PRECISION

MACHINISTS HAVE LEARNED TO RELY ON DE-STA-CO Arbor Spacers and Shims for milling, slitting, gang-saw set-ups and for shimming gears and bearings. De-Sta-Co long-life steel Spacers are packaged in a standard range of sizes from ⅛″ to 4″ hole diameter, up to 5½″ outside, thicknesses from .001″ to .125″, all *with keyway.* Shims are stamped and coined to commercial tolerances in the same preferred sizes, *without keyway.*



Special spacers—thicknesses greater than .125″—are also available in popular sizes, machined from bar stock, hardened and ground, with standard keyways and thickness identifications.

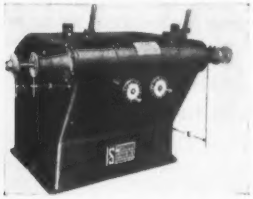
Handy spacer kits of 19 graduated decimal thicknesses are stocked by Mill Supply Dealers in principal industrial centers. *Order your Packaged Precision Today.*

Your De-Sta-Co Toggle Clamp Catalog No. 47 is waiting for you. *Send for it!*

DETROIT STAMPING COMPANY

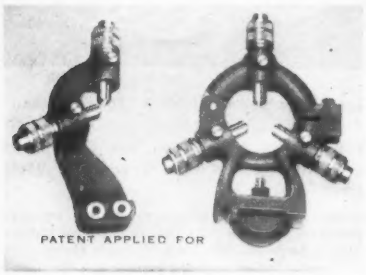
344 Midland Ave Detroit 3, Mich.

3 HP OR 10 HP BUFFING AND POLISHING MACHINES are now announced by the Standard Electrical Tool Co. Known as Type R2V, they were formerly available with only 7½ hp or 5 hp motors. Each side of these machines has its own spindle, permitting each operator to work independently. Both sides are equipped with a ball bearing motor, a magnetic starter, push button station, hand brake, and two



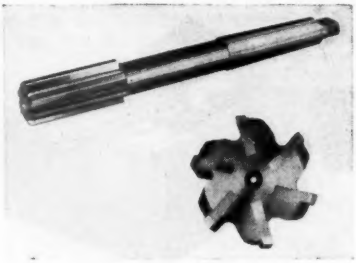
"Speedial" controls. The design is compact in size (32"x30") and effects lower production costs and higher production. For further information, write STANDARD ELECTRICAL TOOL CO., Dept. 470, Mt. Hope & 6th Sts., Cincinnati 4, Ohio, or circle **Inform-A-Gram Key No. A87.**

DE LUXE WORK SUPPORTS, designed to increase speed and efficiency on certain types of lathe work, have been developed by the South Bend Lathe Works. This Follower Rest and the Center Rest feature a simple wrenchless adjustment and locking of the jaws. Each jaw has a large knurled knob for adjusting the jaw position, and a thumb screw for locking. A speedy and accurate adjustment is facilitated by a smooth action with just enough resistance to hold the jaw securely



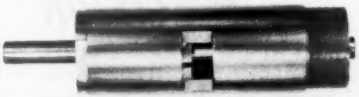
in position. The jaws are made of brass and slide through precision steel sleeves. SOUTH BEND LATHE WORKS, 391 E. Madison, South Bend 22, Ind. **Inform-A-Gram Key No. A80.**

NEW PROCEDURE FOR MAKING HIGH-SPEED REAMERS is announced by U. S. Tool and Manufacturing Co. The cutter blades of



high cost, high speed steel are firmly secured in recesses of a tool body of low cost, low carbon steel by means of a patented rolling process which involves no application of heat as in welding or brazing, which deteriorates temper, hardness, and durability of cutter blades. Worn and undersized reamers can be re-rolled at the factory several times to restore the original diameter to precision limits. U. S. TOOL & MFG. CO., Dept. 812, 6906 Kingsley Ave., Dearborn, Mich., or circle **Inform-A-Gram Key No. A94.**

A NEW TYPE OF STOCK PUSHER has been designed which eliminates the scarring of the rod when being retracted. This new pusher, manufactured by T. H. Lewthwaite Co., gives

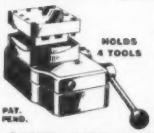


a positive forward feed of the rod without scarring the surface and allows the pusher to be retracted with a minimum of stress. It works on a reverse taper principle. A set of smooth-faced jaws is held in light frictional contact with the rod by a circular spring. The outer surface of the jaws is tapered to match a taper in the holder. When the pusher is moved forward, the jaws are squeezed against the stock; and when the pusher is retracted, the taper releases the jaws instantly and allows them to slide freely. Designed to fit any screw machine. T. H. LEWTHWAITE MACHINE CO., Dept. 37, 314 East 47th St., New York 17, N. Y. **Inform-A-Gram Key No. A88.**

SOUTH BEND

TURRET TOOL BLOCK

Square turret indexes within .0005". Rocker adjustments provided for tools. Mounts on cross slide. Fits current model South Bend Lathes, adaptable to others. Write for dimension sheet.



Size Lathe	Size Sq	Takes Tools	Prices *	Prices **
9"	3"	⅝" x ⅝"	$40	$45
10"	3"	⅝" x ⅝"	40	45
13"	3"	⅝" x ⅝"	—	50
14½"	4"	⅝" x ⅝"	—	70
16"	4"	⅝" x ⅝"	70	75

* Double Tool Cross Slide Model
** Compound Rest Cross Slide Model

SOUTH BEND LATHE WORKS 432A E. Madison St. South Bend 22, Ind.

DUAL CROSS and ROTARY FEED

PALMGREN Rotary, Index MILLING TABLE

No. 83 Only $49.50

Has 8" table, 360° movement and 4" cross feed travel. Adjusting wheels and dials graduated in degrees and thousandths. Slotted for bolting to table. No. 82 without rotary feed $39.75. *Write for Circular No. 10.*

CHICAGO TOOL and ENGINEERING CO.
8388 South Chicago Ave. Chicago 17, Ill.

OCTAGONS, BILLETS AND FORGINGS FOR PRODUCTION,

TOOL & DIE MEN SPECIFY

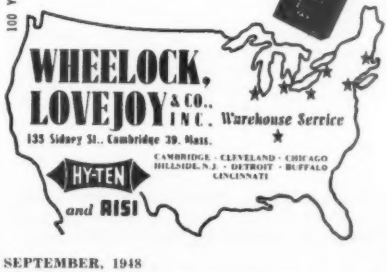
HY-TEN

"M" TEMPER ALLOY STEEL

for maximum machinability and minimum heat-treat distortion. It has great toughness at high degrees of hardness and long-wearing properties for lowest unit cost. For complete information on HY-TEN alloy steels, write for FREE DATA BOOK.

100 YEARS OF SERVICE. ROUNDS, SQUARES, FLATS, HEXAGONS,

TOOL ROOM AND MAINTENANCE REQUIREMENTS.



They're KNURLED!

"Unbrako" Socket Set Screw with KNURLED Cup Point.

Pat'd. & Pats. Pend.

"Unbrako" Socket Set Screw with KNURLED Threads.

UNBRAKO

Reg. U. S. Pat. Off.

SOCKET SCREW PRODUCTS

"Unbrako" Socket Screw Products are of quality alloy steel—the "big point", of which we are justly proud, is our exclusive KNURLING feature, which is incorporated either on threads or points of "Unbrako" Set Screws . . . and upon the threads of our latest design Stripper Bolt, as illustrated . . . this knurling transforms them into excellent "Self-Lockers"—essential in Stripper Bolts subjected to repeated impacts. Of course, the Internal Wrenching feature of "Unbrako" Socket Screw Products results in weight-saving and compact designs. Sizes available from No. 4 to 1½" diameter, in a full range of lengths. Ask for your copy of the "Unbrako" Catalog . . . informative and useful.

Write us for name and address of your nearest "Unbrako" Industrial Distributor.

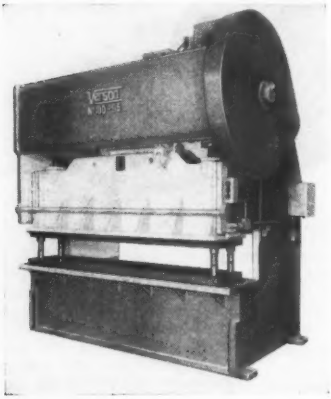
OVER 45 YEARS IN BUSINESS

STANDARD PRESSED STEEL CO.

JENKINTOWN, PA., Box 600

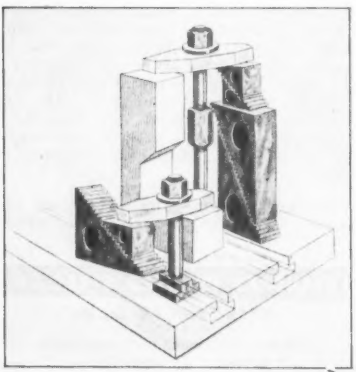
Chicago • Detroit • Indianapolis
St. Louis • San Francisco

NEW GANG PRESS, developed by Verson Allsteel Press Co., bridges the gap between press brakes and large, heavy blanking presses. This new line of gang presses ranges in tonnage from 100 tons to 350 tons in bed lengths from 72" up. These presses are designed to perform a series of operations — such as blanking, forming, punching, and shallow drawing—in one handling.

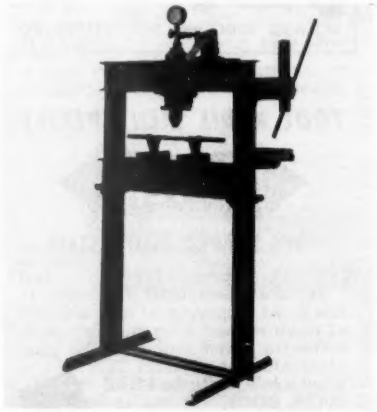


A great saving in time, labor and production costs is effected. They are controlled by means of an electrical push button—either hand or foot operated—and a selector panel for inching, one stroke, or continuous operations. For further details write VERSON ALL-STEEL PRESS CO., Dept. 68, 1355 East 93rd St., Chicago 19, Ill. **Inform-A-Gram Key No. A62.**

STEP BLOCKS, affording adjustments in $\frac{1}{16}$" steps, facilitate machining setups, then use eliminates time spent looking for hit-or-miss temporary blocks and shims for each setup. These blocks, made from either cyanided steel or hard maple, are available from the Northwestern Tool & Engineering Co., Dayton, in twenty piece sets or individual blocks. The blocks are made in three series of sizes ranging from (1) ¾" to 2½"; (2) 1⅛" to 2½"; and (3) 2½" to 6". A new bulletin lists these blocks with prices and also describes Northwestern's jig and fixture parts consisting of knurled head, quarter-turn and shoulder screws, jig feet and pads, T-nut and stud sets, punch press sets, T-nuts and coupling nuts. One page of the bulletin is devoted to the listing of Northwestern's T-nut and stud sets, by catalog number, which are recommended for use on machine tools of many manufacturers. NORTHWESTERN TOOL & ENGINEERING CO., Dept. 88, 117 Hollier Ave., Dayton, Ohio. **Inform-A-Gram Key No. A73.**



MANCO 25 TON HYDRAULIC PRESS is hand-operated, and self-contained — it may be moved about at will—and will perform a wide variety of operations. Manufactured



by Manco Products Co., York, Pa., the press will do pressing, straightening, bending, flattening, broaching, and assembling operations. The press cylinder is a sturdy steel casting. The table is supported by two alloy steel pins which rest in four inverted V-bearings. The press provides a quick application of pressure as the ram travels ⅛" per stroke. Detailed information and literature are available by writing MANCO PRODUCTS CO., Dept. 40, State & Hay Sts., York, Pa., or by circling **Inform-A-Gram Key No. A63.**

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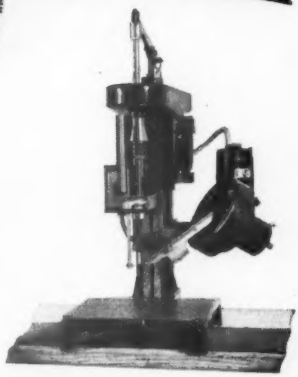

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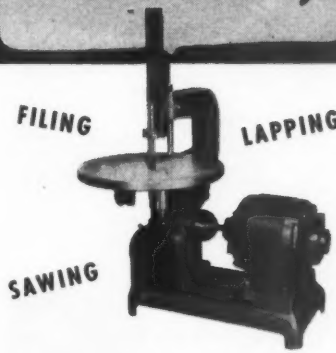
FOR LIGHT OR HEAVY *Die Making*



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The Oliver Die Making Machine is adaptable to light or heavy sawing and filing operations on tool steels up to 1" thick. It stands up—many units have been in continuous use for more than 25 years, cutting direct labor costs from 50% to 60% in many cases.

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Made of finest high speed steel. Available in all standard sizes. Always in stock for *immediate delivery*. Specials made to your specifications.

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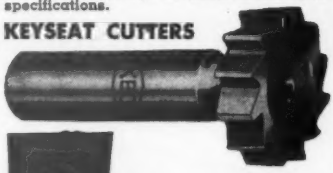

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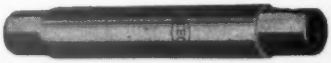

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Illustrated literature and prices on all KEO Products mailed on request.

KEO CUTTERS Inc.
19326 Woodward — Detroit 3 Mich.

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IN STANDARD SIZES AND OVERSIZES ABOVE STANDARD DIMENSIONS

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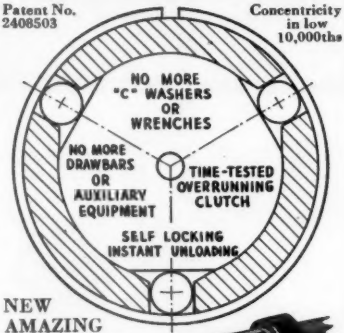
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A REAL HELPING HAND

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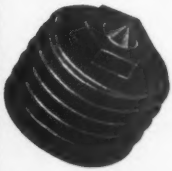

The Heimann Transfer Screw Set is a self-contained, complete tool. No wrenches or pliers are necessary. Made in 3/16" to 1" diameters.

Send for price list.

HEIMANN MFG. CO.

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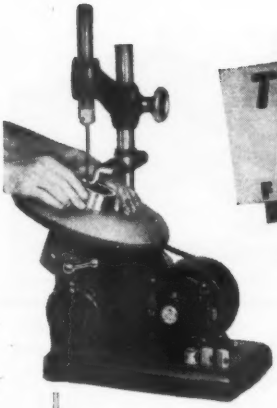

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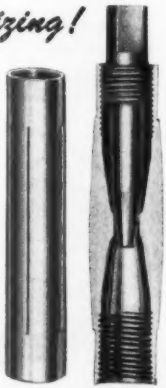
Also available in sizes 7/32", 9/32", 11/32" 13/32", 15/32", 9/16" and 5/8". For lapping holes smaller than 3/16", use the *Midget Lap*. Fourteen sizes: .032, .036, .040, .046, .054, .070, .079, .090, .104, .120, .135, .155, .170. Trial assortment (14 laps).....**$1.50**



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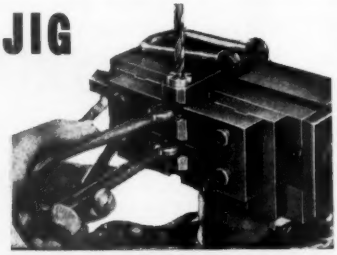
FOR DRILL PRESS OR TAPER

To hold parts of any description



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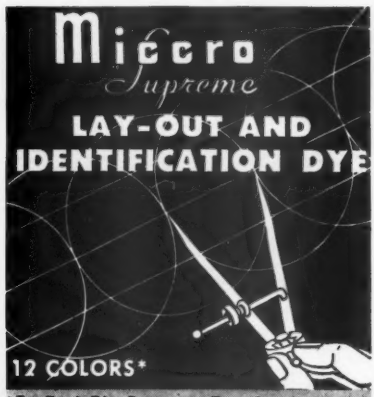

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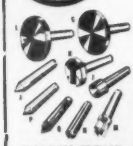

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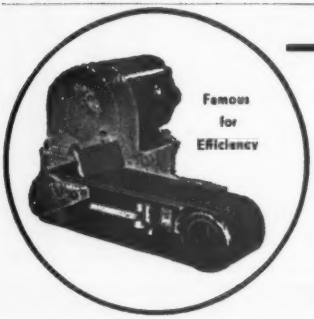

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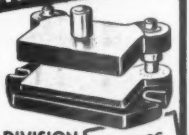

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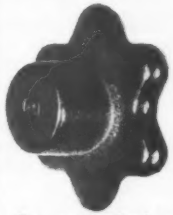

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¾"	$ .06 each	2"	$ .17 each
1¼"	.08 each	2½"	.25 each
1½"	.10 each	3"	.30 each

Prices are F.O.B. Cleveland

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MINIMUM ORDER—$2.00.
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DoALL Metal Powder Presses

It is becoming more and more apparent that the use of metal powders for the fabrication of parts is a technique that industry is fast beginning to appreciate as a real economical production system. This increased use is due to the extensive research in the past few years which has greatly extended the range of powder metal applications. Some of the production economies that can be effected by this process are startling. Parts that require multiple machining or those that are intricate in design should be analyzed. For instance, a hardened steel gear of about 1" diameter, 20 pitch with a ⅛" face having an eccentric cam on one side, can be produced for one cent each as compared to other methods which run from five to twenty times higher. In the automotive industry metal powder parts are used extensively. One manufacturer is using 300 parts per car.

Research during the past few years has solved most problems connected with compounded blends of various metal powders. Today, the possibilities of duplicating the physical characteristics of any metal are practically unlimited in this field. Some metal powder parts have been known to develop tensile strength of 200,000 psi. All kinds of ferrous and non-ferrous metals and alloys can be used in the metal powder process. It is also possible to use combinations of metals which cannot be made by casting. As an illustration, brake discs are made by the metal powder process using bronze and silica. Tungsten carbide and other carbides are also used in this process which often eliminates further machining operations. Metal powder has done an outstanding job for parts that require unusual electrical qualities. Stainless steel parts and abrasion resisting metals are all readily made by this process.

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The DoALL Co., Dept. 1-30, 254 North Laurel Ave., Des Plaines, Ill., or circle our **Inform-A-Gram Key No. D5.**

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The DAHLSTROM TAP GUIDE virtually eliminates tap breakage—and saves those costly hours spent prying broken taps out of dies. Saves time, too. Just a few turns of the handle and the job is done. Winds through continuously, with no back-off. Work is always dependably straight and square.

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$52.50 F. O. B. Minneapolis

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INCREASE PRESS ACCURACY

BALL JOINT SHANKS eliminate perpendicular misalignment between shank clamp bushing and die set.

BALL ACTION DI-ALINERS automatically correct press misalignment, front to back, right to left, or diagonal. Matched spherical plates, machined and cadmium plated for long life.

As much as twice the usual production per grind is routine performance for these precision die sets, according to actual job records. Responsible for their success are pre-loaded ball or roller bearing guide pins. Pre-loading prevents play between pins and bushings, guarantees perfect alignment and precise parallelism, so that punch and die engage cleanly and squarely every time.

Lempco Anti-Friction Die Sets set up quickly and easily . . . open and close freely by hand . . . eliminate lubrication troubles . . . give you more production per grind and longer die life. They are manufactured in any standard or special size to meet your exact specifications. Write for catalog.

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ANGLE PLATE DIE GRINDER

TYPE VA

2 H.P. AND 3 H.P.

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Equipped with Push Button Safety Starter having overload protection.

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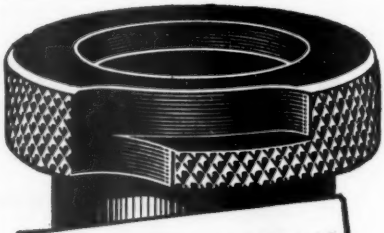

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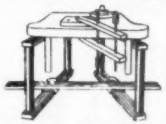

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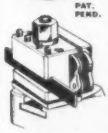

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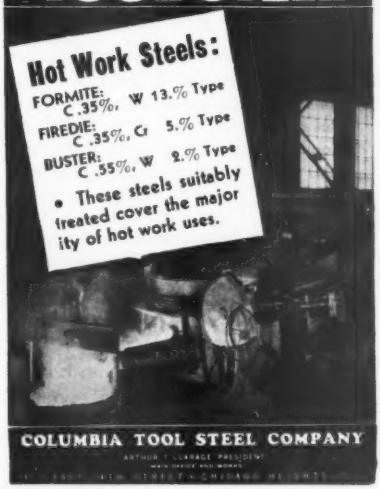
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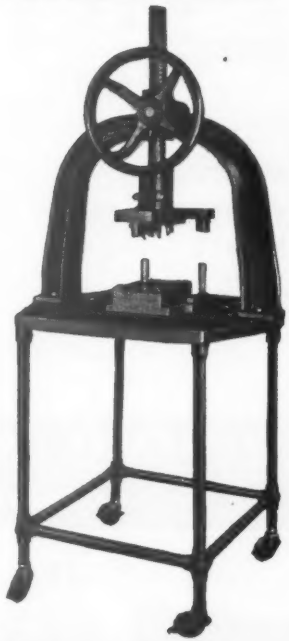

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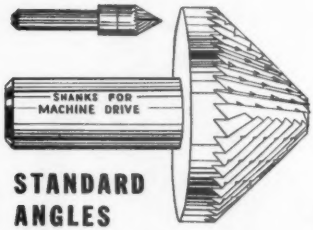

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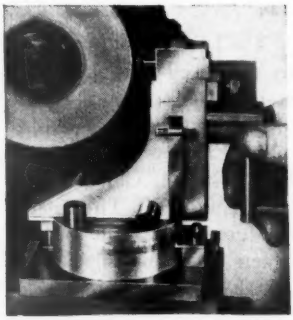

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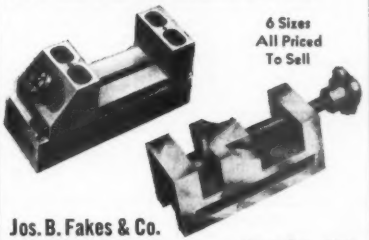

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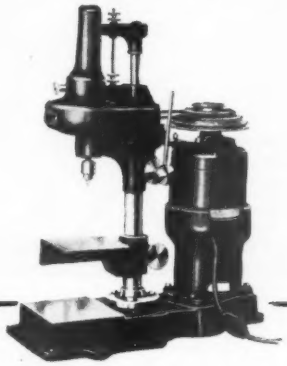

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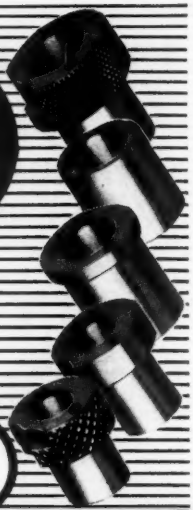

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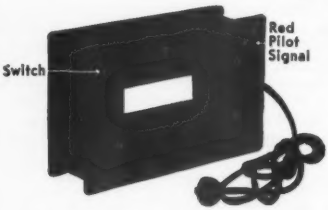

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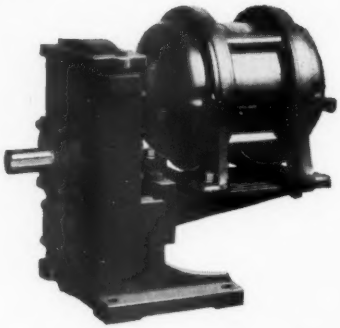

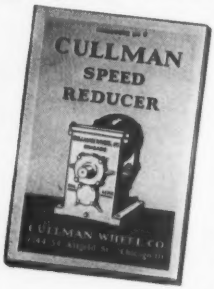

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